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Report

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COMMISSION ON INVENTORY

of

WORLD LAND USE

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INTERNATIONAL GEOGRAPHICAL UNION

COMMISSION ON
INVENTORY OF WORLD LAND USE

REPORT

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This report has been written up from the materials sent in by Commission members and consultants to the Chairman, Dr. S. Van Valkenburg, Director, Graduate School of Geography, Clark University, Worcester, Massachusetts. All errors and omissions are due to the chairman not to the Commission as a whole.

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WORLD LAND USE SURVEY REPORT

At the International Geographical Congress held at Washington in August, 1952, the Commission on World Land Use, appointed at the Lisbon Congress of 1949, was continued. The members of the Commission were:

Prof. Hans Boesch
Prof. Henri Gaussen
Prof. Pierre Gourou
Prof. Preston James
Prof. L. Dudley Stamp
Prof. Samuel Van Valkenburg, Chairman

Corresponding members were:

Prof. J. Wreford Watson
Prof. F.J. Ormeling
Mr. S. Faissol
Prof. Erich Otremba
Prof. Nafis Ahmad
Prof. S.P. Chatterjee

Because the preliminary work, establishing a world land use classification and the making of pilot studies, had been done during the period 1949-1952 the major stress was on the promotion of land use mapping. While this mapping is in progress all over the world it seems advisable to give a survey of the present stage of world land use mapping, independent of the system of mapping used.

The survey has been compiled by Dr. L. Dudley Stamp and the Chairman of the Commission, with the cooperation of the other members and many other geographers. The survey had to be selective and claims no completeness. It is hoped that this survey will be a contribution, and of value to all geographers interested in land use.

Before starting the actual survey part of the report published for the Washington Conference in 1952 is repeated in order that the reader will have a complete picture of the original work done by the Commission as well as the Key of World Land Use mapping. In that report the Commission expressed its purpose in the following words.

"THE WORLD LAND USE SURVEY

"Recognizing the urgency of the problems of world population and world food supply which are the concern in greater or less degree of all the countries of the world, we consider that present factual knowledge is inadequate to serve as a proper function for schemes of improvement and development, especially in those areas which are commonly regarded as 'underdeveloped'.

"Many countries collect statistics of land use and agriculture, sometimes in very considerable detail. The Food and Agricultural Organization of the United Nations (FAO) has also planned a comprehensive census of agriculture and land use so that in the future many more statistics will be available. We are aware also of varied plans for soil surveys and detailed local surveys. We do not consider, however, that these other plans in any way invalidate the need for the land use survey we have in mind, to which statistical material will be complementary. Only by recording the facts on maps can actual areas and distributions be shown and this is where the work of the World Land Use Survey will be both fundamental and unique.

"Since all development of redevelopment must obviously start from the present position, we believe that the two immediate and prime essentials are an exact knowledge of the present position and, as far as possible, an understanding of the reasons for that position.

"We therefore consider that for all parts of the world there should be a survey of land use together with an interpretation. This involves (a) maps embodying the survey and (b) explanatory memoirs.

"We place our main emphasis on maps because there is no other way of showing actual location and distribution of the varying types of land use and any changes proposed will involve changes in the pattern of distribution shown on the map.

"Of the many types of maps some are purely factual and based on actual observations or survey; others are concerned with interpretation or development of ideas, that is to say they are subjective. We think it is most important to keep these two types separate and we are positive that the first must precede the second. We give details later of the survey of existing land use which we propose and which from experience in several parts of the world we are

convinced can and will be used for a great variety of purposes in the future, provided the basic survey is accurate and records facts, not merely opinions.

"The first object of the Survey will be to record the present use of land in all parts of the world on a uniform system of classification and notation with such amplification as may be necessary locally. The Survey will be carried out on the most appropriate scale available to secure accuracy and will be based essentially on field work together with the interpretation of such material as air photographs."

"THE USE OF THE SURVEY AND THE MAPS

"In framing these proposals, we have had in mind surveys already carried out in several parts of the world and the use which has been made of them.

"In the first place the survey proposed is not only fundamental to all development programs but is also one which because it is definite and limited in scope can and should be carried out in a short space of time. We are fully aware of the many other investigations which are needed, such as soil surveys, ecological, climatological, and demographic studies, and we hope that in many areas it will be possible for such studies to proceed simultaneously. A land use survey and appropriate maps occupy, however, a special, indeed unique, position.

"With respect to the uses to which the survey and maps are to be put, we would point out that such a survey, factual and objective, is basic and has many uses some of which may not even appear at first sight. The detailed survey of Britain, for example, which was carried out before the outbreak of World War II, by indicating both plowed land and land argiculturally sub-marginal (rough grazing), showed the areas where wartime expansion was possible or needed. Together with subsequent land classification studies, it was later used to indicate areas for the expansion of industry and housing and new town sites in such a way as to cause least disturbance to the existing economy. Anomalies in land use -- tracts underdeveloped when compared with neighboring tracts -- immediately stand out by contrasting colors on the map and call attention both to the problems and to the exact areas needing detailed investigation.

"Similar examples could be given from many other countries.

"On the other hand, the absence of land use surveys in underdeveloped countries makes it impossible to formulate other than very generalized schemes of development. It is clear also that unless the present use of land is known and understood, development schemes may cut across the existing economic structure in such a way as to cause more harm than good."

"THE CLASSIFICATION OF LAND USE

"Each country will decide after consultation with the Permanent Headquarters the scale to be used; but in general it is suggested that the larger the scale the better. Experience in several countries has shown that accurate delineation of areas is possible on 1-inch-to-one-mile maps (or 1:62,500 scale approximately) and on larger scales, and is possible in some cases on scale of 1:200,000 or 1:250,000. On smaller scales some generalization is needed and in many cases the maps thus lose some accuracy as a land use survey.

"In order to secure uniformity for the world map on the scale of 1:1,000,000 a master key must be adopted. After very careful consideration of all the factors and of the views expressed by our expert witnesses we have drawn up the following classification of categories of land use to be recognized and mapped.

1. Settlements and associated non-agricultural lands (dark and light red)
2. Horticulture (deep purple)
3. Tree and other perennial crops (light purple)
4. Cropland:
   a. Continual and rotation cropping (dark brown)
   b. Land rotation (light brown)
5. Improved permanent pasture (managed or enclosed) (light green)
6. Unimproved grazing land
   a. Used (orange)
   b. Not used (yellow)
7. Woodlands
   a. Dense (dark green)
   b. Open (medium green)
   c. Scrub (olive green)
   d. Swamp forests (blue green)

e. Cut over or burnt over forest areas (green stipple)
f. Forest with subsidiary cultivation (green with brown dots)

8. Swamps and marshes (fresh- and salt-water, non-forested) (blue)
9. Unproductive land (gray)

"The master key will be found sufficient for maps on the scale of 1:1,000,000 and for remote areas, such as the heart of the Amazon Basin in Brazil or the sparsely populated parts of Africa. The master key should be enlarged according to needs indicated by local conditions and the scale of maps on which the survey is being carried out. The enlarged specification should always be one which can be correlated with the master key.

"1. Settlements and Associated Non-Agricultural Lands (dark and light red)

"While on the 1:1,000,000 map it will not be possible to do more than indicate by one color (dark red) the areas covered by cities and towns, in industrial and developed countries where large scale maps are available it may be desirable to distinguish between different types of settlement on the survey maps. According to need, local classifications may be used to distinguish between different phases of urban land use of functional zones.

"Extensive surface mining areas including land devastated owing to mine operations should be indicated in light red and explained in accompanying notes.

"2. Horticulture (deep purple)

"This category should be used to include all intensive cultivation of vegetables and small fruits (as distinguished from tree fruits). The category, therefore, covers such agriculture as truck farming in America, market gardening in Britain and other European countries, as well as the production from larger gardens and allotments, whether the crops are grown for sale or not. Where vegetables are grown in rotation with ordinary farm crops the area should be recorded as category 4, cropland. This category of horticulture also includes the

'garden cultivation' of tropical villages -- for example, in Africa, Malaya, etc., where the village compound usually includes mixed vegetables such as yams, potatoes, with fruit and sometimes with small numbers of palm trees, cocoa trees, bananas, etc.

"3. Tree and Other Perennial Crops (light purple)

"A very wide range is covered by this category and the land to be included will differ very much from one part of the world to another, so that in each different survey, or on each survey sheet, the crops concerned should be named or indicated by means of symbols. In the tropics there will be included, amongst others, rubber plantations, cocoa plantations, coffee plantations, tea gardens, palm oil plantations, coconut groves, citrus orchards, cinchona plantations, and banana plantations. In middle latitudes the category will include citrus orchards, orchards of deciduous fruits -- such as apples, pears, plums, cherries, peaches, apricots, and figs -- also olive groves and vineyards of different types. The category should also be used to include the groves of "cork oaks" (as in Portugal) and also such rare cases as plantations of pine trees grown especially for the production of resins and turpentine. The category should also be used to include such perennial crops or cultivations grown without rotation as sisal and manila hemp, but sugar cane or alfalfa, although grown on the same piece of land for a number of years, should be recorded as growing on cropland.

"4. Cropland

a. Continual and rotation cropping (dark brown)
b. Land rotation (light brown)

"The cropland will include both plowed land and land cultivated by hand. By continual crops we means, for example, rice, which is often the only crop grown year after year on the same land, also sugar cane and such mono-cultural crops as wheat and corn. By rotation crops we include those grown in a fixed or variable rotation, including fodder, grass, clover, and alfalfa, which may

occupy the land for two or three years. Crop rotation includes 'current fallows', that is land which is rested for a short period (not exceeding three years). All the above are to be shown in dark brown.

"By land rotation we understand the system whereby cultivation is carried on for a few years and then the land allowed to rest perhaps for a considerable period before the scrub or grass which grows up is again cleared and the land recultivated. In such areas, however, the farms or settlements from which cultivation takes place are fixed and the cultivation of the land is the dominant occupation. The secondary growth which is allowed to appear has little or no economic importance. This is in contrast to the forest with subsidiary cultivation mentioned later.

"5. Improved Permanent Pasture (Managed or Enclosed)(light green)

"This is a type of land use well understood in countries like New Zealand and Britain where controlled grazing is carried on in small enclosed fields the grass being managed by manuring, sometimes by reseeding, by liming, or in other ways. Often the grasses, including clovers, have been introduced so that the pasture is not 'natural'. Some land of this sort is grazed; other is cut for hay or dried grass. In other countries, such as the United States, this category of land is less distinctive but would include land such as the intensively stocked grasslands of the dairy belts.

"6. Unimproved Grazing Land (orange and yellow)

"This may be described as extensive pasture or range land. It may be enclosed in large units but is not as a rule in small fields. It is not fertilized or deliberately manured though it may be periodically burnt over. The vegetation is that which is native to the locality although the characteristics of the vegetation have often been modified by grazing or occasionally by the introduction of non-local plants.

"A great range of vegetation is included, from tropical savana to arctic tundra, and as far as possible the type of vegetation should be described on the map or accompanying notes. For example, this category will include savana (or grassland with scattered trees where the grass is dominant),

tropical grassland (e.g. llanos), steppe land, dry pampas, and short grass prairie. The category will also include such range lands as bunch grass and sage brush and creosote bush, as well as the vegetation of the High Veld and the Karoo of South Africa. It will include the heather moorlands and heath lands and grass moorlands of Europe. It is clear that special care must be taken to distinguish these very varied types.

"There are many areas of such land which at present are not used in different parts of the world though they differ but little from those which are used for grazing. This difference should determine the color, orange for used and yellow for not used.

"7. Woodlands (different shades of green)

"Forest and woodland will be found to differ very greatly from one part of the world to another. The main categories suggested refer to the morphological character of the forest, independently of the age of the tree.

a. Dense. Forests where the crowns of the trees are touching (dark green)
b. Open. Where the crowns of the trees do not touch and the land between is occupied by grass or other ground vegetation. Where, of course, the trees are very sparse such land comes into category 6 (Grazing Land) (medium green)
c. Scrub. Is used to designate vegetation such as the maquis of Europe, chaparral of North America, mallee and mulga of Australia, and the acacia thorn scrub of Africa and India (olive green)
d. Swamp forests, both fresh water and tidal (mangrove) (blue green) (stippled with the green of the respective color)
e. Cut over or burnt over forest areas not yet fully reclothed (stippled with the green of the respective color)
f. Forest with subsidiary cultivation (green with brown dots)
    i. Shifting cultivation, where patches of land are recleared for cultivation from time to time, usually but not always, by wandering tribes.

ii. Forest-crop economy. Somewhat similar in the system, for example in parts of eastern Canada, where holdings consist mainly of woodland but where some cultivation is carried on subsidiary to the working and management by replanting of the forest land.

"The type of forest, whether dense, open, scrub, can usually be distinguished by symbols into the following: (e) evergreen broad-leaved, (sd) semi-deciduous, (d) deciduous, (c) coniferous, (m) mixed coniferous and deciduous. In addition, in many parts of the world it should be possible to name the dominant species or groups of trees and indicate the type of undergrowth. It may also be possible to indicate in broad outline where forest land is being commercially exploited.

"8. Swamps and Marshes (Fresh- and Salt-Water, Non-forested) (blue)

"9. Unproductive Land (gray)

"A great variety of land is also included in this category. Considered in relation to land use it appears bare, and though it may support lowly forms of plant life is essentially unproductive. Barren mountains, rocky and sandy deserts, moving sand dunes, salt flats, and ice fields are examples. Potential use, such as land capable of irrigation, may be indicated and considered in the memoir but it is the present position which should be mapped.

"Important Note

"Where land falls into two categories, as olive groves with cultivation of wheat between the trees, this should be indicated by a combination of the appropriate colors."

PROBLEMS WHICH AROSE IN USING THE CLASSIFICATION

The problems were of three kinds; namely, what scale to use in the actual field mapping, the fact that the classification was too general for detailed studies, and how to handle the intermixing of two or more categories.

The scale to be used on actual mapping depends on what kind of topographic maps are available (if there are any) and the character of the land use, whether complex or rather uniform. Scale varies, for example between the work done by Dr. Preston E. James in Northeast Brazil on a scale of 1:1,000,000 and the enlarging of maps of a scale of 1:25,000 as done by Dr. Monica Cole in her study of the Transvaal Low Veld. A good example of a case in which no maps were available was the work done in Iraq by Hunting Aerosurveys. This work is based on 1:15,000 photography which proved of great value in difficult country; the final survey was at a scale of 1:50,000. Another case is the land use mapping in Southern Alberta (Canada), a rather uniform area which was mapped by air, transferred to the 1:63,360 scale, and further reduced to a 1:190,080 scale, at which scale a certain amount of generalization was necessary. As Preston E. James (quoted in the first Report of the Commission) stated, "On a scale of 1:10,000 it is possible to show area differences as small as half of a hectare but at 1:1,000,000 to be visible on the map a category of area must occupy at least 25 square kilometers (10 square miles)."

The fact that the classification was too general for detailed studies was recognized by the Commission when it stated that the master key should be enlarged according to needs indicated by local conditions and the scale of the maps on which the survey is carried out. This is especially the case for differentiation between crops which can be indicated by letters, symbols, or numbers. This can go quite far; for instance in his proposed land use classification Engineer J.L. Unger uses seven symbols for rice alone. Theoretically, there is no limit except for the clearness of the map.

Mixed land use offers a more difficult problem. It can either mean that several types of land use are found next to each other, the actual area of them too small to be recognized separately or that they are active at the same

spot, for instance crops and fruit trees or trees and grazing. The first case was met in Canada in the following way. When 60 per cent or more of a unit (block) area is occupied by one use, that class is mapped accordingly. If no class is dominant and two uses accounted for 60 per cent or more, then the two classes are combined. If no one or two uses account for 60 per cent or more then a new category of mixed land use is introduced which in the World Land Use qualification would mean the use of three or more colors. The same idea of combining colors solves the case of land falling into two categories, such as olive groves with cultivation of wheat between the trees. This can be done by lines or stripes of the appropriate colors or by the use of dots on top of the color, indicating the more valuable of the two categories. In experimental maps of parts of East Africa on the scale of 1:50,000 oblique strips were used and the widths of the stripes varied according to the proportion of land in each category.

WORLD SURVEY OF LAND USE MAPPING

With the cooperation of members of the Commission and of many others Dr. L. Dudley Stamp and the Chairman of the Commission have compiled a survey of the present stage of world land use mapping. The survey had to be selective and completeness is not claimed. Many smaller projects are not considered or not known. The survey is not limited to those maps which use the key proposed by the World Land Use Commission at the Washington Conference.

This survey is only a first attempt to give a general picture of the work which has been done. The authors hope it will serve its purpose and will be followed by more complete studies and kept up to date.

Asia

Japan

The pressure of population on land resources in Japan has long been severe but is now so acute as to be unparalleled in any other country of comparable extent. Of land of all types there is only just over one acre per head: the cultivable land to produce sustenance for the people is only one-fifth of an acre, compared with a world standard of 1.2 acres. The scientific study of land and other natural resources is thus of highest priority and the Government has set up the Resources Council, a top level advisory group to the cabinet, under the Prime Minister's office. In March, 1949, the Council passed its Recommendation No. 3 to conduct a precise land use survey as a basis for future planning. The necessary Land Survey Law was passed in February, 1951. When Dr. Stamp visited Japan in March, 1955, at the invitation of the Resources Council he met the members and saw the work completed to date, and in progress. No other country in the world has undertaken such a complete record of land use and the series of fully colored land use maps on the scale of 1:50,000 is undoubtedly the finest technically as well as the most comprehensive produced by any country. These maps are being prepared with the collaboration of Provincial Governments and hence some

sheets cover only to the provincial boundary. More than a quarter of the whole country has already been published, but unfortunately the maps are not on public sale, being regarded as secret or restricted. They are entirely in Japanese, but a key has been printed in both Japanese and English.

The outline of the map, fully colored, is printed in buff, while a deep brown plate is used for the very comprehensive legend and for a wide range of information related to cities and towns. In these the commercial area, heavy industrial area, light industrial area, housing area, transportation area, and public area are separately shown.

Some 32 types of land use are distinguished by colors, apart from much additional information given by overprinted symbols. The principal categories of land use distinguished may be summarized as follows:

Paddy Field	(1) Triple cropped	(3) Single cropped
	(2) Double cropped	(4) Perennial crops
Upland Field	(1) Triple cropped	(4) Single cropped
	(2) Double cropped	
	(3) Three crops every two years	(5) Fire field

Symbols distinguish vegetables, industrial crops, flowers, forage crops, etc.

Tree Crops	(1) Orchards	(2) Orchards intercropped with field crops
	(3) Mulberry Garden	(4) Mulberry Garden intercropped
	(5) Tea Garden	(6) Tea Garden intercropped

Symbols distinguish different trees and are used also to indicate scattered trees

Forest Area	(1) Conifers	(5) Thin forest
	(2) Broad-leaf trees	(6) Deforested land
	(3) Mixed	(7) Newly forested
	(4) Bamboo	(8) Dwarf trees and shrubs

Symbols distinguish species of trees

Grass Land	(1) Grass	(3) Dwarf bamboo
	(2) Water weeds	(4) Meadow
Others	(1) Salt bed	
	(2) Barren land	
	(3) Fish culture area	

Boundaries of pasture, seasonal grazing land, national forest, and national parks shown

Land Features	(1) Swampy land	(2) Peat bog

Taiwan

Under the energetic direction of Cheng-Siang Chen, Professor and Director of the Institute of Agricultural Geography of the National Taiwan University at Taipei, a large amount of very important work in land use is being carried out. Professor Cheng-Siang Chen has prepared and published an agricultural atlas of the whole island and has had a detailed land use survey carried out. This is being published in 22 sheets. The rural maps are advertised as on a scale of 1:100,000, the urban on the scale of 1:10,000. These maps are in Chinese. Sheet 2 for Keelung Municipality shows the built-up areas in black and then distinguishes four other types of land use, covering the whole area. The final map for the whole island will be published in color on the scale of 1:250,000.

Hong Kong

The British Colony of Hong Kong covers the island of that name, a number of other islands, and a considerable section of the mainland totaling in all about 396 square miles. The island of Hong Kong and the adjacent part of the mainland at Kowloon across the sheltered harbor have provided homes for most of the $2\frac{1}{2}$ million people, nearly 2 million of whom are Chinese refugees who have flocked in since the Japanese occupation was terminated in 1945. The

area presents in miniature an epitome of the physical geography of South China and hence a land use survey is a pilot survey of exceptional interest. The geology is very varied with large granite masses giving rise to hill and mountain tracts from which the former forest cover has been almost entirely removed, exposing the deeply-rotted granite to atmospheric weathering, which has produced a special type of badlands. Such a huge population demands a large and constant supply of water with afforestation to protect from erosion the gathering grounds of the reservoirs. Through intensive cultivation of valleys and terraced hillsides the Chinese market gardeners of the small colony succeed in producing three-quarters of the vegetables needed by the vast population, and on the flat alluvial lands some of the rice they need is also produced. All these features are faithfully shown in the magnificent Land Utilization Map of Hong Kong and the New Territories surveyed by Dr. T.R. Tregear of the Department of Geography of the University of Hong Kong. The map is on the scale of 1:80,000 and is published by the University of Hong Kong University Press, together with a brief explanatory text (1955) which includes a map of geology and a note on soils by Professor S.G. Davis. The map distinguishes 8 categories of land use -- woodland, scrub, rough grassland and scrub under 12 inches, badlands heavily eroded, arable, swamp, houses with gardens, and built-up areas or agriculturally unproductive. This scheme, like the colors used, is a slight modification to suit local conditions of the Commission's recommendations. The whole work is one greatly to be commended for study.

Malaya

Although Malaya has a total area of approximately 50,000 square miles, more than three-quarters of this area is occupied by densely forested mountains, virtually uninhabited. The population is concentrated in the valleys of the western coastal strip, and to a less extent in valleys emptying out to the east coast. In these lowlands there is a fierce competition for land between the many interests, for alluvial tin, the commercial crops rubber, coconut, and oil palm, and the subsistence crops of rice and miscellaneous vegetables. In recent years much

attention has accordingly been given to detailed land use mapping, especially under the stimulus of inquiries made by the World Bank. Detailed land utilization maps on the scale of 1:50,000 are in course of publication, and sheets have appeared for parts of Trengganu and Kelantan. In 1953 there was published an excellent map of the whole of Malaya on the scale of 12 miles to one inch (1:760,320) which is entitled Malaya: Land Utilization Map. On examination, however, this map, like the detailed ones, is found to be not one of actual land use but one of land alienation -- that is, of land which has been leased or sold or otherwise alienated for specific uses. The map distinguishes eight types of land alienation -- for rubber, rice, coconuts, oil palm, pineapples, miscellaneous cultivation, mining, and forest reserves. Even so, more than half the map remains white -- non alienated land, not in forest reserves but presumably occupied mainly by forest.

There is still need in Malaya for maps and studies of existing land use. It is, for example, quite impossible that an area of over 100 square miles, colored as alientated for mining, should all be so used. Similarly, one suspects that only small parts of the large areas in the east alientated for rubber are actually cleared and planted.

Indonesia

The topographic maps published by Topographic Service (formerly the Royal Netherlands Indies Topographic Service) contain a great deal of land use information, such as the indication of forests and rice fields and also, by way of symbols, individual crops and types of vegetation. Enlarging on this kind of land use mapping, J.L. Unger, Agricultural Engineer of the Bureau for Land Utilization, Bogor, Indonesia, published in 1952 an elaborate classification for land use and agronomic mapping (Tectona Vol. XLII, plates 17-60 published by the Bureau for Land Utilization). His main categories are: 1. Vegetation and Wood crops (40 types), 2. Land Use and Occupations (37 types), 3. Deterioration and Conservation (11 types), 4. Pedilogic Features (13 types), 5. Relief (16 types), 6. Hydrography (46 types), 7. Communications (30 types), 8. Buildings and Industry (16 types), 9. Government and

Public Institutions (18 types), 10. Borders (9 types) and 11. Miscellaneous Symbols (5 types). Differentiation is made by way of color, symbols, numbers (latin and arabic), percentages, and different types of lines. As far as agriculture is concerned this classification stresses intensity as well as season, and, for the livestock, density per aerial unit as well as number of cattle owners in percentage of the total population.

Of course it would be impossible to show all these details on one map. The author envisages several maps (soil, vegetation, etc.) but favors also combining certain facts on one map to trace possible relationships between them. The scale of the maps planned will be 1:50,000. While this is probably one of the most complete classifications ever constructed, it will take a great deal of work and knowledge to collect all the information and draw boundaries between the numerous types. However, it is recommended for study, as an example of completeness as far as Indonesia conditions are concerned.

British Borneo

Miss A.R. Irawathy, now Principal of Queen Mary College, Madras, came to the University of London to work under Dr. Stamp in the development of land use studies based on the interpretation of air photographs. With her long personal knowledge of tropical conditions, including the wet lands of Burma, she worked on air photographs of Northern Borneo. Her thesis, approved for the Degree of Ph.D. of the University of London, included a general background account of British North Borneo, and detailed land use maps of sample areas especially around Jesselton and Sandakan (1952-1954).

Burma

The detailed one-inch maps of Burma like those of India have always been land use maps. The later ones show in color cultivated land (yellow), scrub or open forest (light green), and close forest (dark green). In the course of the many years of British administration an immense amount of

data on land use, actual and potential productivity of the land, was collected, and Mr. C.J. Richards has shown that it is possible to arrange this material and to color maps on the scale of four miles to one inch (1:253,440) according to the scheme of the World Land Use Survey.

The economic development of Burma depends so largely on the production of rice and other primary produce from an effective use of the land, that much attention has been given to the study of land use since independence in 1948. By resolution of 12 July, 1954, the Union of Burma Agricultural Planning Advisory Committee was set up under the Prime Minister, and among its objectives were to advise on setting up an agricultural, including land utilization, survey. Professor Ma Thin Kyi, Professor of Geography in the University of Rangoon, is playing an active part in the work. On 8 February, 1955, Dr. Stamp met the Committee and discussed the desirability of a land use survey. There is good material available for a detailed survey and important recent work has been carried out by Mr. T.M. Bushnell of Purdue University, U.S.A., on soils, with the aid of excellent modern air photographs covering 80,000 square miles.

India

In the vast area of India the organization of a land use survey is a huge undertaking, but it is recognized as a vital need. Professor S.P. Chatterjee, Professor of Geography in the University of Calcutta, is playing a major role. Under his guidance some detailed land use sheets of the Bengal area have been prepared in manuscript and illustrate beautifully the extreme complexity of the land use pattern. A strong Advisory Committee has been constituted by the Government of India with the Minister for Natural Resources and Scientific Research as Chairman to guide work on the National Atlas of India. Professor Chatterjee is Member-Secretary, and all the geographical societies of India have been recognized as collaborators. A Land Utilization Survey of India is planned as one of the major activities of the Committee.

In the meantime field work is in progress in different parts of India. Dr. C.D. Despande, Principal of M.N. College, Vishnagar, reports that in Bombay State sample studies have

been undertaken in North Kanara, Krishna Valley, Dharwar, and Kolhapur.

There have been humerous studies on the general problems of land use in many parts of India. There are in progress detailed field-to-field surveys of sample villages -- for example in Uttar Pradesh by Mr. M. Shafi, now working on his results under Dr. Stamp in the University of London. Mr. Ujagir Singh, of the University of Banaras, has published a sample study of five villages near Sarnath, in Vol. 1 of the National Geographical Journal of India, 1955.

Pakistan

The two parts of the Islamic Republic of Pakistan offer some remarkable contrasts. Eastern Pakistan, the eastern two-thirds of the old province of Bengal with some bordering hill lands on the east, consists mainly of the very densely peopled rice- and jute-growing alluvial lands of the Ganga-Brahmaputra delta. Western Pakistan consists of the broad valley plains of the great river Indus and its tributaries, the five rivers of the Punjab, bordered on the west by the arid hills of Baluchistan and the North West Frontier and on the east fading into the Thar Desert.

There is need of a land use survey in East Pakistan for several reasons, but especially because of the vital need for land where extension of cultivation is possible and because of the existence of cultivable land now abandoned for varied reasons, including the incidence of diseases. A general survey of the whole has been made by Dr. Nafis Ahmad, Head of the Department of Geography of the University of Dacca in his Atlas of East Pakistan, 1956, and this emphasizes the need for detailed work.

In West Pakistan the plain lands can be very fertile if water is available by irrigation, but in the past new irrigation settlements were laid out without any investigation of soils and other vital factors. In consequence huge problems have arisen -- water logging, deterioration of land by accumulation of salt, soil erosion, silting, unchecked flooding, and spread of sandy wastes to name but a few. The Government very wisely recognized the need for a more systematic approach and commissioned Hunting Aerosurveys to carry out an aerial survey and to produce land use

maps, reconnaissance soil maps, and a report. The work was actually carried out by the Resources Survey Division of the Photographic Survey Corporation Limited of Toronto. They flew over the whole area of the plains and prepared a photo mosaic on the scale of 1:40,000. The work was begun in November, 1953, and the field work, greatly assisted by the use of helicopters, was completed in the two seasons 1953-54 and 1954-55. After adequate samples had been worked out on the ground, the air photographs are being interpreted in the Toronto office. Two series of maps are being prepared, both on the 1:250,000 scale; one is of present land use, the other of main soil groups with indications of potential use. Dr. Stamp visited the party in the field in Bahawalpur State in January, 1955, and discussed the whole program, agreeing to the modifications of the Commission's scheme as shown below:

Symbol	Class	Definition
1	Settlements	Urban land, mining and quarrying operations, airfields, etc.
3	Plantations	Trees and other crops, occurring in orchard, vineyard, or other perennial form.
4	Cropland	Cultivated land including fallow (which is grazed)
4a	Perennial Irrigation	Land irrigated throughout the year, usually land commanded by barrages, but also land irrigated from Springs and tube-wells.
4b	Seasonal Irrigation	Land irrigated by canals, filled during the high-water period. Also land seasonally inundated by river overflow.
4c	Sailaba Cultivation	Land watered by surface run-off trapped in field bunds.
4d	Barani Cultivation	Land dependent for water supply on normal rainfall in all seasons.
6	Unimproved Grazing Land	Land used for grazing.
6a	Range Land	Land covered by low herbaceous vegetation of medium

		to low density, e.g., sage-brush, grasses, etc.
6b	Scrub Land	Land covered by shrubby growth with or without herbaceous cover between the clumps. It is used for grazing, browse and also for fuel wood.
7	Woodland	Land used for production of wood for lumber and fuel.
7a	Reserved Forest	Land on which cutting of trees is restricted and controlled.
7b	Unreserved Woodland	Land on which cutting of wood is restricted.
7c	Swamp Forest	Fresh-water or tidal lands with tree cover.
8	Marsh	Fresh or salt-water, non-forested lands. Often used for grazing and wild life.
9	Unused Land	Land not used for any purpose defined in Classes 1 to 8.
9a	Desert Land	Large areas of dry sandy waste with dune formations and sparse vegetation, usually desert scrub.
9b	Rocky Mountainous Land	Mountains, dissected plateaus and bedrock exposures. Little or no vegetation.
9c	Other Unused Land	Areas with little or no vegetation because of severe salinity or drought.

It is interesting to note that the Pakistan government was the first to follow, as a national expedient, the Commission's recommendations.

Iran

Dr. Hassan Ganji reports that land use mapping is still in the planning stage.

Aden and Somaliland

A Survey of Soils and Areas Suitable for Irrigation is in progress under the Colonial Development and Welfare Scheme of the United Kingdom Government.

Iraq

Hunting Aerosurveys (Headquarters: 6 Elstree Way, Boreham Wood, Herts) is currently engaged on a soil and land classification survey carried out for Messrs. Binnie, Deacon & Gourley, who are now Consultants to the Iraq Development Board and responsible for the overall engineering lay-out. This survey involves a great deal of groundwork, with a team of 10 men, including 8 soil surveyors, a chemist, and one soils engineer engaged in field permeability tests, permanently in the field over a period of 8 months. In addition the team has included for part of the time an ecologist and an agriculturist, with a visit from a consultant specializing in reclamation of salty land. The work has been based on 1:15,000 photography, which has proved of great value in (pedologically) difficult country. The ancient irrigation lay-out is clearly visible on the aerial photographs and provides clues to many soil problems which would have been very puzzling without their aid.

The full survey involves soil and land classification (for irrigation) maps at 1:50,000, together with a comprehensive report recommending systems of agriculture for the new areas, when brought under irrigation, and the size of holding which would support a settler family at a reasonable standard of living.

Mosaics at 1:20,000 and 1:50,000 have proved very valuable as working maps for the field parties.

A smaller forest survey has recently been carried out in the mountain area of Northern Iraq, with two main purposes in view. The first was to assess the value to the Iraq Forest Department of the existing 1:40,000 scale aerial photographs covering the whole of the forest area. The second was to provide certain basic data on the forest types by making detailed enumeration of sample plots.

Enlargements to 1:20,000 scale were made to assist

preliminary photo-interpretation, and it was found possible to make a distinction between forest in different density and site classes, and even, to a more limited extent, to determine exploitation and botanical composition. The field work, based on the preliminary interpretative work, proved the value of the photographs and allowed truly representative plots to be selected and access to them planned with minimum waste of time. Plot enumeration will provide valuable basic data on age, size, and growth rate of different tree species, data never before obtained in Iraq and which is very necessary reforestation program now being considered.

An excellent map of land use of Iraq, using the World Land Use Classification, has been made by D. Hywel Davies. His report on that map follows.

Studies for "A Provisional Land Use Map of Iraq" were carried out during 1952 and 1953. The map, which is on the 1:1,000,000 scale, covers the whole country in two sheets, and is printed in Arabic and English. With the aid of a grant from the Iraqi Ministry of Education, it was published by the Geography Department of the College of Arts and Science, where the author was at the time a lecturer; and printed at the Directorate-General of the Surveys, Baghdad, late in 1954. The delay in printing was largely the result of disastrous floods of that year, during which many victims from outside the Baghdad city walls were encamped in the grounds of the Survey Department. Together with air photographs, and personal observation and discussion, the map was compiled mainly from the following map sources:

(1) 1:1,000,000 GSGS International Edition (British, American, and German printings). (Basemap)
(2) 1:500,000 GSGS. (English)
(3) 1:500,000 (Arabic)
(4) 1:253,000 GSGS (English)
(5) 1:10,000 (Arabic)
(6) 1:5,000,000 (Arabic)
(7) 1:10,000 map of Amarah Rice Areas. (Arabic; annual)
(8) 1:253,000 Forest Map of Iraq, from Chapman, "Report on the Forests of Iraq", Baghdad.
(9) Maps on various scales from Haigh, "Report on Irrigation in Iraq", Baghdad.
(10) Maps on various scales from Sousa, "Handbook on Iraq Irrigation", Baghdad.

It was found that the general land use classification proposed by the World Land Use Survey was readily adaptable for Iraq. Improved Permanent Pasture and all Woodland types except "Scrub Oak Woodland" were omitted, while the colors for Horticulture and Tree Crops had normally to be combined by means of stripes in order to represent local conditions; but the only important change in the classification was that the colors for "Used" and "Unused" Unimproved Grazing Land were used instead for "Highland" and "Lowland" Unimproved Grazing Land, thus distinguishing between transhumance in Iraqi Kurdistan and the nomadic and semi-nomadic pastoral economies of lowland Iraq.

The decision to attempt a provisional land use map of the whole country, rather than detailed ones of small areas, was necessitated largely by the inadequacy of the base maps for detailed work and by travel restrictions on foreigners at that time, which made it impossible to visit certain significant areas for detailed study. But more important is the fact that detailed studies will, of necessity, be slow to build up an overall picture; while Iraq is at present beginning to undergo a tremendous revolution in land use as the projects of the Iraq Development Board begin to bear fruit. It therefore seemed to the author more compatable with the expressed aims of the World Land Use Survey -- of presenting certain facts as the basis for overall planning -- to provide a provisional map covering the whole country before these changes in land use come about. It is also hoped that the map will provide a basis for future detailed studies, particularly of the areas affected by the new irrigation schemes.

Jordan

The U.S. Operations Mission to Jordan is working on methods of pasture improvement in the country, livestock being the mainstay of the bulk of the population. As a necessary first step in pasture improvement or vegetation and soil conservation measures, a basic survey of present conditions is being carried out using the complete photographic cover of Jordan obtained in 1953.

Preliminary work by an ecologist, to determine the extent to which the existing photography could be used

in mapping uniform vegetation types, was carried out in the spring of 1954, and in the spring of this year a team consisting of an ecologist and a geologist spent three months in the field, visiting all parts of Jordan.

There field work will provide a key for the mapping of vegetation units throughout the country. Jordan will, therefore, be supplied with vegetation maps, based on mosaics constructed from aerial photographs, which will form the necessary and valuable basis for a pasture improvement program.

Palestine

Professor David H.K. Amiran, Chairman of the Department of Geography of the Hebrew University at Jerusalem, reports that Mr. Y. Karmon carried out a pilot survey of the Hule Plain in the uppermost Jordan Valley. This survey was completed in 1951. Prior to drafting the final report the area was resurveyed in 1954. The report containing land utilization maps on a scale 1:50,000 for 1951 and 1954 is in print -- in Hebrew. Mr. Karmon at present is mapping the Plain of Sharon one of the most intensely cultivated regions of Israel. Land use mapping done by the British for the Committee Report during the Mandate period has not much practical value any more because of the great changes which took place afterwards.

Syria - Lebanon

While no official land use mapping has been reported, there are several spot studies of agriculture. Interesting for instance is the study by Norman N. Lewis on Lebanon -- "The Mountains and Its Terraces". (The Geographical Review, Vol. 43, No. 1, 1953).

Turkey

No land use mapping is in progress. For a general review of Turkish agriculture and crop distribution see "The Agricultural Regions of Turkey" by Sirri Erinc and Necdet

Tuncdilek. (The Geographical Review, Vol. 42, No. 2, 1952)

Cyprus

At a meeting of the European Working Party for Land and Water Conservation of the Food and Agriculture Organization (FAO) of United Nations held in Rome in 1952, a resolution was passed urging all member nations to carry out a survey of existing land use. At that conference the United Kingdom was represented by Dr. L. Dudley Stamp and the Government of Cyprus by Mr. P.C. Chambers, Director of Agriculture. At the invitation of Mr. Chambers, Dr. Stamp visited Cyprus over Easter, 1953, to discuss ways of implementing the resolution of carrying out land use and soil surveys. At that time Mr. Demetrios Christodoulou of the Morphou Training College, Cyprus, had carried out a number of pilot village surveys and in October, 1953, he came to the University of London to study under Professor Stamp methods of land use survey and land planning. He prepared an exhaustive report, using a wide range of published and unpublished material, much of it in the Greek language, on the evolution of the land use pattern in Cyprus. For this study he was awarded the degree of Ph.D. of the University of London. The British Air Ministry of at the same time loaned a series of some 3,000 to 4,000 air photographs covering the whole of Cyprus. A team of aerial photograph interpreters under the direction of Mr. R.R. Rawson and Mr. K.R. Sealey, Lecturers in Geography at the London School of Economics (University of London) constructed from these a complete land use map of Cyprus using the base maps on the scale of 1:50,000. These sheets were completed in January, 1956, and a map of the whole island on a reduced scale is in course of preparation for publication, together with Dr. Christodoulou's monograph.

Australia and Oceania

Australia

Land use mapping and land use studies have been carried out in Australia by the Federal Government and State Depart-

ments, as well as by universities and private persons.

1. Commonwealth Scientific and Industrial Research Organization (C.S.I.R.O.): Department of National Development, Canberra. The Regional Survey and Land Use section, under the direction of Mr. C.S. Christian, has completed several studies (with maps) of large areas in the northern part of Australia and is at present working in New Guinea. An example of that is the Survey of the Barkley Region made in 1947-48 and published in 1954. Part VIII of this survey is called "The Land Systems of the Barkley Region" by C.S. Christian and R.A. Perry, and Part IX "The Land Use Groups of the Barkley Region" by C.S. Christian and G.A. Stewart. They recognized 38 land systems and 11 land use groups. A land system is an area or group of areas throughout which there is a recurring pattern of topography, soils, and vegetation. Although land systems are well differentiated on the basis of their inherent land characteristics, there are factors common to groups of land systems which have an overruling influence on land use. Such groups of land systems are called land use groups. The maps are on a scale of 1:1,000,000 and the area covered was 120,000 square miles. Different colors are used for the 11 land use groups and for each a description is given as well as details of water supply and present land use, and also a statement on potential land use. Similar surveys have been made for the Katherine Darwin Region (Land Research Series No. 1, Melbourne, 1952) and of the Townsville-Bowen Region (Land Research Series No. 2, Melbourne, 1953).

2. The Queensland Bureau of Investigation. Brisbane Technical Bulletin No. 3, for instance, studies the Callide, Don, and Dee Valleys and has a map scale 4 miles to an inch differentiating between cultivated land, land used for grazing by dairy cattle, land used for grazing by beef cattle, and land used for grazing by sheep.

Technical bulletin No. 4 is a survey of the Neb-Collensville Region and includes a map of land classification. A map of land use was also published for the Darling Downs, the key being the same as that of Technical Bulletin No. 3.

3. New South Wales Regional Planning office (Premier's Department). Reports on the resources of every region in the State have been published, including generalized land use maps.

4. Victorian Central Planning Authority (Premier's Department). Reports and maps after the style of those in

New South Wales are being prepared. Several have already been published.

5. Tasmanian Town and Country Planning Commission. An atlas showing the resources of the State has been published.

6. Department of National Development, Canberra. An atlas of Australian Resources consisting of some 40-50 maps is being compiled. The maps are being published in series of five and are being sold by Angus and Robertson of Sydney. Already 15 maps are on sale, five are about to be printed, and a further five (including one on dominant land use) are in the compilation stage.

7. Adelaide University, Department of Geography. Studies (with maps) have been made of the region directly south of Adelaide, but have not been published. Land Use Survey of the Hundred of Kuitpo area covered 100 square miles. A study of a much larger area is now under way.

8. Department of Geography of the University of Western Australia. Studies made by students covering area of different agricultural value.

9. Mr. R. Kent Wilson, Melbourne University, has drawn (but not published) some 20 maps of Victoria showing types of farming.

10. Professor Wadham, Melbourne University, has organized and taken part in a number of land use studies in Victoria. He is also joint author of "Land Utilization in Australia".

New Zealand

Dr. J.W. Fox reports as follows:

The study of land use in New Zealand has, during the past twenty years, shown two distinct trends. The systematic scientists have paid increasing attention to problems associated with land development -- a fact not unremarkable in a country where land resources are far from fully developed and pioneering farming is still significant. Within the Departments of Scientific and Industrial Research and of Agriculture investigations have been directed mainly at determining the physical properties of land and how these influence its utilization, while the surveys at present being undertaken by the Land Utilization Division of the Department of Lands & Survey are aimed at the classification of land for

development purposes.

Geographers, on the other hand, have been more concerned with objective, formal surveys following the pattern of the Land Utilization Survey of Britain, although Cumberland in 1944 did outline a scheme for a nation-wide land-use survey based on the fractional notation system. No response to this suggestion was evoked in official circles, so that even today New Zealand still lacks an inventory of her major economic resource -- the land.

The work of geographers has been confined mainly to regional survey, using the land-use map as an approach to areal appreciation. Third-year students undertake these surveys as an integral part of the course on the regional geography of New Zealand. Some postgraduate students have presented theses based on land-use studies. Thus, in general, the study of land use in this country has remained unco-ordinated, and shows, moreover, a distinct confusion of thought.

In an attempt to remedy this state of affairs, James W. Fox, Senior Lecturer in Geography at Auckland University College, has proposed a logical classification of land use in New Zealand. ("Land-Use Survey: General Principles and a New Zealand Example", Auckland University College Bulletin, Geography Series No.1 - in press.) This scheme is the outcome of several years' work with senior students and of research into land-use problems in the northern King Country of the North Island. It may be correlated directly with the classification adopted by the World Land Use Survey. Departments of geography in the four university colleges have been asked to use this classification as a basis for their fieldwork studies, particularly in the third year. Gradually, then, comparable data on land use are now being recorded, and it is proposed that a central office be established where maps recording these data may be preserved. Along with them will be housed the land-use maps of the Northern King Country prepared by Mr. Fox. These manuscript sheets on the scale of 1:63,360 are the only ones corresponding to topographic sheets, although, in fact, the relevant sheets in this case have not been published. All other land-use maps are regional in character and have been draughted on the scale of 1:15,840. Areas covered in this way include the districts of Dargaville, Tauranga, Thames, Hamilton, New Plymouth, and Whangarei in the North Island,

and parts of the Clutha Valley in the South Island.

The government of New Zealand is being urged to undertake a dominion-wide survey of land use, using the classification proposed by Mr. Fox, as part of a national stock-taking of resources. The classification is simple to understand and is adaptable to the capabilities of surveyors and to the varying scales of base maps that are likely to be available. Given financial help and official recognition the survey could be completed in a few years. The preparation of reports would take additional time, but, in all, five to eight years would seem to be a fair estimate for the carrying out of a complete survey.

Western Samoa

Dr. J.W. Fox reports that a land-use survey is proceeding under direction of Auckland University College. Apia and its environs and twenty typical villages are being studied in detail. In addition it is planned to produce a generalized land use map of the whole territory based on field work and the interpretation of aerial photographs.

Africa

Union of South Africa

Under the direction of Dr. J.H. Moolman, the Natural Resources Development Council of the Union of South Africa has a very active program which includes regional surveys and the mapping of different aspects of land use. In addition the following studies including land use are completed or are in progress.

1. Rhodes University, Grahamtown, thanks to a grant, is making a survey of the so-called Border Area, which will include a land use map using the World Land Use Classification. The map will cover 1547 square miles comprising both areas of European farming and Native Reserves. Scale of the map will be 1:125,000; field work was done on a scale varying from 1:18,000 to 1:125,000 and on aerial photos.

2. Land studies in the Transvaal Lowveld by Dr. Monica

M. Cole. Papers of World Land Use Survey, No. 1, editor L. Dudley Stamp, London School of Economics, 1956.

This is a detailed most interesting study of the Crocodile-Kumati drainage basin in the eastern Transvaal where all kinds of subtropical fruits are raised under irrigation in the river valleys, with special emphasis on citrus fruit, making this the major producing area of such fruits in the Union. Land use mapping was done on topographic maps, scales 1:50,000 and 1:25,000, which were enlarged for field purposes.

3. Veld types of South Africa by J.P.H. Acocks, M.Sc., Division of Botany and Plant Pathology, Department of Agriculture, Government Printer, Pretoria, 1951. Map presents in color combinations 70 veld types which belong to seven major vegetation divisions. The scale of the map is 1:1,500,000. This is a modification of the Agro-Economic Regions of the Union by the Department of Agriculture.

4. Land use survey of the Elgin District of the Cape by Dr. Monica M. Cole (South Africa Geographical Journal).

5. General studies on Farming Regions: J.H. Moolman for the Cape (University of Stellenbosch). (South African Geographical Journal, Vol. 37, 1955). Buchanan and Hurwitz for Natal (Economic Geography, Vol. 27, 1951) and for the Union in general T.J.D. Fair (South African Geographical Journal, Vol. 33, 1951.)

Inter-tropical Africa

Professor L. Dudley Stamp established the Old World Division of the World Land Use Survey with headquarters in London at the London School of Economics. The work done there on African material (by Mr. John Callow and Mrs. Stone) includes:

a. The study of air photographs of parts of Nyasaland and Tanganyika (kindly loaned by the Directorate of Colonial Surveys) from which the "Preliminary Plots" on the scale of 1:50,000 have been prepared.

b. The study of air photographs of Mauritius at the request of the Mauritius Government.

It may be mentioned that the work on the African material was part only of the whole study, and other areas investigated in the tropics included the Island of Antigua (by Mr. Callow) and selected areas in Borneo (by Dr. Irawathy).

Some general conclusions reached include the following:

a. The scheme of classification is valid except that it is not possible to separate "used" and "unused" rough grazing.

b. Complete land use maps can be constructed from air photographs of adequate quality with quite a small amount of ground control and checking. Provisional maps were sent out to experts in each area, and once a particular type of land shown by a distinctive tone on the photographs had been correctly identified on the ground mapping could continue over large neighboring areas.

c. Even in areas where large monotonous tracts were expected (e.g., parts of Tanganyika) the air photographs revealed a surprising complexity such as could be shown only with some difficulty on the scale of 1:50,000. Any smaller scale involved generalization and any maps on the scale of 1:1,000,000 could only give a very broad picture.

d. The complexity of pattern suggests the need for the most careful analysis of the factors responsible and suggests the reason for the failure of grandiose schemes of development without sufficient previous investigation.

Maps prepared in MSS (at headquarters in London) include:

Nyasaland. Four sheets covering Zomba and the country to the north and east -- to the shores of Lake Shirwa. (South D-36/X-I-N.E., X-I-S.E., X-II-N.W., X-II-S.W.)

Tanganyika. Four sheets in the Rukwa Lake and Rift Valley area. (South B-36/T-II-S.W., T-II-S.E., T-III-N.E., T-IV-N.E.)

The Directorate of Colonial Surveys (DCS), which is the official organization charged with the task of preparing maps (mainly of the scale of 1:50,000) of the British Colonial Territories, has a Land Use Officer attached to its staff.

Mauritius

The Government of Mauritius requested the London Office of the World Land Use Survey to attempt the construction of a land use map based on the interpretation of air photographs supplied by them. The work was undertaken by Mrs. Gillian Stone, under the general direction of Dr. Stamp, and the Curepipe sheet on the scale of 1:50,000 was completed and despatched to Mauritius for local comment. It was agreed that the interpretation of air photographs gave a very com-

plete and accurate picture. It was then agreed that the Directorate of Colonial Surveys should work on other sheets officially, and the Head of the Directorate, Brigadier M. Hotine, reports that out of the thirteen sheets covering the island, sheets 1, 2 and 4 have been completed and sheets 3, 5, 6, and 7 have been interpreted ready for drawing, but instructions of the Mauritius Government are awaited as to whether they desire the whole to be finished.

Uganda

A land use study of the Uganda Protectorate by John H. Dean, dissertation of the Graduate School of Geography, Clark University: detailed study of the area north of Lake Victoria (Elephant Grass Region) containing the heart of the Protectorate, with the bulk of the population and most of the exportable crops.

Sudan

Professor J.H.G. Lebon of University College of Khartoum reports as follows: (see also Report of the Makerere Symposium, International Geographical Union, 1956).

The country examplifies categories of large, thinly peopled lands. The area is ten times as large as the Gold Coast.

Largest scale of topographical maps is 1:250,000. There are over 60 sheets, but many consist of sketched topography with blanks. Air photo coverage exists as follows:

1. Northern third by trimetrozon (U.S.A.A.F. 1943/45). For plotting and interpretation the photographs suffer from foreshortening along the outer edges of oblique strips. Haze is also troublesome.

2. Vertical strips, taken since 1945, by the Survey Department. Few large areas have been covered.

Three local series of maps on 1:100,000 have been produced, comparable to the Preliminary Plots of 1:50,000 by the Directorate of Colonial Surveys.

1. Rainland series; 2. Jonglei series; 3. Equatoria series. Sheet lines and index numbers are derived from the 1:250,000 sheets.

No surveying on the World Land Use Classification has yet been undertaken; but four surveys of parts of the country have been involved mapping and appraisal of existing and potential land use.

1. The Jonglei Investigation 1948/51. The Report in four volumes has just been published. The object was to investigate the effect on the livelihood of Nilotic tribes of the Egyptian proposal to control the White Nile. In the course of the work the vegetation, soils, and hydrology of the sudd area have been mapped in detail.

2. The Report of the Southern Development Committee, 1951/54. This deals with the three southern provinces of Upper Nile, Equatoria, and Bahr-el-Ghazal, and includes maps of soils, vegetation and economics.

3. Report on Irrigable Areas, undertaken by London consultants to estimate the extent of lands which can be watered by the flow from the proposed Roseires dam, and by further pumping schemes along the White Nile. This report is accompanied by a series of 1:25,000 sheets showing vegetation and soil types, based upon the interpretation of air photographs produced under contract by a London firm.

4. An unpublished paper by Dr.S.G. Willimot of the Yambio Experimental Farm, Equatoria, entitled "Cultivable Land and Land Use in Equatoria Province, Sudan". Dr. Willimot uses available statistics, existing maps, and air photo graphs to show that 13 per cent of western Equatoria is unproductive or is used for non-agricultural purposes. Of the remaining 87 per cent which is cultivable only 2 per cent is actually cropped in any year.

Ethiopia

Dr. Gordon B. Schilz, Director of the Imperial Ethiopean Mapping and Geographic Institute at Addis Ababa, reports that land use mapping will start in the near future.

Belgian Congo

The Royal Colonial Belgian Institute is publishing an atlas of the Belgian Congo. One of the maps called "Production Vegetale du Congo Belge" (notice par J.A. Henrard)

appeared in 1953. The map is on a scale 1:5,000,000. On the map are indicated the area of concentration of cotton, rice, palm oil, cafea robusta, cafea arabica, cacao, jute, and rubber. For a general picture the map is useful.

Gold Coast

The following is a report by J.B. Wills, Department of Soil and Land Use Survey, Gold Coast.

The Gold Coast Department of Soil and Land Use Survey has commenced the detailed preliminary soil, vegetation, and land use survey of the country as a whole. Twenty-three geographical regions based on drainage basins have been delineated and surveys are proceeding region by region. Maps to accompany the printed reports will be mainly on the scale of 1:250,000. The estimated area of the closed forest zone is 30,135 square miles, of which 13,000 square miles have been or are being surveyed at the present date, initial surveys having been concentrated in this zone. The rest of the country, comprising principally tree and grass savannah, totals some 61,708 square miles of which 5,200 square miles have been surveyed. Detailed information is available from several special surveys which have been carried out in various localities throughout the country and from aerial photographs, but limited use has been made of the latter on account of their inferior quality and unsuitable scales.

Additional land use information is also being obtained in the intensive survey of the cacao areas, commenced in 1946 by the Department of Agriculture. The results are mapped in black and white on the scale 1:15,625. Several investigatory agricultural and crop surveys have also been undertaken by this Department.

A census of livestock was undertaken in 1951-52 by the Department of Animal Health; and a map on the scale of 1:500,000 has been prepared by the Forestry Department showing the remaining areas of high forest and savannah woodland in 1953. A certain amount of information is also obtainable from the medium scale, general topographical sheets of the country.

A provisional expanded definition of the categories of the World Land Use Survey scheme has been drawn up for use in the Department and is tabulated separately for

(a) small and medium scale and (b) large-scale maps. The former is little changed from the scheme as it stands; in the latter, each category is defined with particular reference to the various subdivisions as they occur in the country.

A preliminary land use map of the Gold Coast, scale 1:500,000, has now been completed and is now in course of publication. It has been compiled from the sources listed, and such relevant information as is available. The legend for this is given with reference to the Department's expanded definition of categories.

Wherever possible, the use of complicated hatching has been avoided as this is thought to detract from the cartographical clarity of maps and the difficulties imposed by the use of colour pencils in the production of manuscript maps are mentioned briefly. In view of the present heavy costs of producing printed maps, the drawing up of a black-and-white "color" scheme might be considered for application to the world scheme, in order to encourage its widest possible utilization.

Portuguese Africa

Atlas de Portugal Ultramarino, Ministerio das Colonias, Lisbon 1948.

Carta das Actividades Economicas.

Scale: Guine 1:1,500,000 Angola 1:6,000,000
Mocambique 1:6,000,000 and also Timor 1:500,000.

The maps indicate the general location of the major crops.

French West and Equatorial Africa

C. Toupet of the Institut Francais d'Afrique Noir at Dakar proposed a classification of land use at the Colloquium on Geography held at Ifan 5-10 Jan., 1955. This is published in the Report of the Makerere Symposium of September 1955 (International Geographical Union, 1956).

North West Africa (see under France)

Europe

In reporting the mapping of land use in Europe one must have in mind that the European countries have excellent topographic maps which often contain agrarian information. While the more recent emphasis has been on increasing production and planning, many countries have concentrated on soil capability maps. A leader in that field is Dr. C.H. Edelman of the University of Wageningen in the Netherlands. Nevertheless the great value of the land use mapping of Great Britain done under the direction of Dr. L. Dudley Stamp calls the attention to the fact that also in countries with advanced techniques of land use factual land use information, put down in map form, is basic for planning. Local studies, however, are numerous, made under government auspices or by the geography departments of universities. Results can be found in the geographical periodicals, but no effort is made here to list them.

Italy

Professor Colamonico reports as follows:

Under the decision taken at the International Geographical Congress in Lisbon (1949) to draw up a world land exploitation map 1:1,000,000, a national Italian committee was formed, which presented a sample sheet of a map of Italy 1:200,000 at Washington in 1952 to which an illustrative report which I had written was added. The sample sheet was very favorably received.

In consequence the Italian Committee drew up a plan for the preparation of the map which is to comprise 26 sheets to be published by regional groups. At the Rio de Janeiro Congress two large maps of Calabria are to be presented which will also contain Southern Basilicata and the southern section of the Salerno territory.

Each group of regional maps will be accompanied by an illustrative essay. The essay containing Calabria, which has been written by Professor Milone of the Roman University, is also to be presented at the Rio de Janeiro Congress.

The whole work is being carried on under the direction of the Centro Studi di Geografia Economica of Napoli financed by the Consiglio Nazionale delle Ricerche, executed by the

Direzione Generale del Catasto (land survey), and published by the Italian Touring Club.

The preparation of the two sheets of Calabria has entailed a longer time, because the Committee has in the meantime by study, consultation, and discussion agreed upon the general principles on which the work for the whole of Italy is to be based, namely, upon the choice of crops to reproduce and the manner of their production. Now, the groundwork having been minutely and carefully planned for the whole Italian territory, it will be easy to prepare and quickly to bring out the successive regional sheets, beginning with those of Southern Italy.

Professor Giuseppe Medici of the Instituto Nazionale Economia Agraria (Rome Via Barberini 36) plans to compile a world map of agriculture. The program of work rests upon the following points:

1) The map should present the forms of land use according to prevailing crop types and also the distribution of ownership and agricultural contracts.

2) It should be constructed without regard to the administrative boundaries of States but with regard to large agricultural regions.

3) It should be on the scale of 1:3,000,000.

4) Probably two or three different maps would be required for each area, showing (a) type of farming, (b) ownership, and (c) agricultural contracts.

5) It should be accompanied by a descriptive work on the main characteristics of agriculture in all countries, but without too much statistical documentation.

A colored map of a sample area in Central Italy was published in 1956; it stresses particularly land tenure.

Malta

The densely populated and highly cultivated islands of Malta and Gozo provide an obviously important area for a pilot survey of a country where the extreme pressure of population on land resources renders an intensive study of the problem of land use one of vital importance. The island of Malta has an excellent series of base maps, being covered by 148 sheets on the scale of 25 inches to one mile (1:2,500) as well as by maps on the scale of 6 inches

to one mile (1:10,560), and there is a good general map on 2 inches to one mile (1:31,680). For Gozo there is a two-inch map and a full air cover of photographs.

Lord Gort, when Governor, instructed Mr. Hirst, the Acting Director of Agriculture, to prepare a land use map following the general scheme of the Land Utilization Survey of Britain. Carried out under the general direction of Mr. George Bonett, Government Field Surveyor, it took longer than anticipated but brought out the serious inaccuracy of returns previously made by farmers. In the summer of 1954 a 2-inch map of Malta, colored according to the scheme of the World Land Use Survey, was completed and a copy made, together with a version in black and white. A block was made of the latter and it was published as a plate to the Malta Year Book for 1955 as well as in The Times of Malta for Thursday, January 6, 1955. It shows a four-fold division of the land into arable, waste, citrus, and built-up areas.

In 1953 and 1954, Dr. W. B. Fisher, Head of the Department of Geography in the Durham Colleges of the University of Durham, visited Malta and later proposals were agreed upon for academic collaboration in certain field studies between the Vice Chancellor and Rector Magnificus of the Royal University of Malta and the University of Durham. In 1955 a part of six British geographers visited Malta and carried out a field to field survey of land use, covering two-thirds of the island on the scales of 1:2,500 and 1:10,560. A very full report entitled Agriculture in Malta: A Survey of Land Use, 1955, was prepared by H. Bowen-Jones, and issued in mimeographed form. It is obtainable from the Department of Geography of the University of Durham. It is planned to complete the field survey of Malta and to cover Gozo also.

Spain

The "Consejo Superior Geografico" reported in 1954 that the work on the "Mapa Agronomica Nacional" on a scale of 1:50,000 had been temporarily suspended. Of the 1,130 planned sheets only a few had been completed. As no copy could be obtained no description could be given.

Portugal

Under the title of the Plano Fomento Agrario the Government is preparing what is probably the most complete series of land use and complementary maps attempted for any country in the world. In 1946 Portuguese experts went to Britain and under the direction of Dr. L.D. Stamp and Dr. E.C. Willatts studied the work of the Land Utilization Survey and its subsequent developments in the fields of both town and country planning. The survey was strongly influenced by British experience, and the results can easily be correlated with the W.L.U.S. Scheme. The basic maps (Carta Agricola e Florestal de Portugal) are on the scale of 1:25,000 and are hand colored. They show 26 types of land use by a series of colors and in addition the scattered fruit and other economic tree crops are indicated by symbols and also the dominant species of forest trees.

The classification of land use is as follows:

Arable cultivation, irrigated
Arable cultivation, dry
Ricefields
Vineyards
Olive orchards
Almond orchards
Citrus orchards
Orchards, mixed fruits
Various fruits
Pasture and permanent grass
Woodland: oak; cork oak; Mediterranean oak; locust trees; eucalypts and acacia; chestnuts, other broad-leaved; Pinus maritime; Pinus pinea; other conifers; mixed forest.
Scrub (medsonhal)
Brush (mato)
Uncultivated
Coastal marshes (sapal)
Saltings

Amongst the "complimentary" maps being prepared are many showing distribution, density and types of domestic animals and chief crops, many classified in detail.

Four series of parallel explanatory maps are also being produced:

(a) Soil, prepared on 1:20,000, to be published in 1:50,000 (a good soil map of the whole country exists)

(b) Gradient maps, with classification of slopes.
(c) Climate
(d) Population, distinguishing population to be fed or supplied from primary population engaged in food production.

By superimposing soil and gradient maps schemes of land capability or potential utilization and liability to erosion are indicated. The main final map to be published on the scale of 1:50,000 will show basically land use but will also indicate soil, terrain, and slopes and so stress potential use. Among other factors being studied water is fundamental — its availability, possibility of storage, and selection of areas and soils suitable for irrigation. Many large irrigation projects are contemplated but there is not enough water for all the possible areas.

Santa Maria, Azores

Under the leadership of Mr. Hugh Prince, a party of geographers from University College, University of London, visited this island in 1951 and made a complete land use survey to test out the classification proposed by the Commission. They found the scheme could be applied with minor modifications to suit local conditions, and their maps and report were mimeographed for distribution to participants at the Washington Congress in 1952.

France and the French Union

France is preparing a most beautiful set of maps under the auspices of the "Centre National de la Recherche Scientifique". The plan is much more elaborate than the World Land Use Survey and as the name indicates special stress is upon the vegetative cover.

At the "Centre de Cartographie de la végétation" at the University of Toulousse under the direction of Professor M. Gaussen two sets of maps are prepared. One of these is the Carte de la Végétation al:200,000 of which at present the following sheets have been published: France, Toulouse, Perpignan, Antibes, Le Puy, Mont-de-Marson and Alençon.

Algeria: Oran, Béni-Abbès and Bosquet-Mostaganem. Morocco: Rabat-Casablanca and French West Africa: Thiès, Bouaké and Diafarabé. In preparation are France: Nice-Montauban, Algeria: Guelt-es-Stel-Djelfa, Alger, Morocco: Mazagan, La Guadeloupe: Iles de la Société and La Réunion. The maps are detailed and of extraordinarily high standard with magnificent coloring indicating the types of vegetation, the colors varying from yellow and orange for the vegetation of climates of dryness or with a outspoken dry to vivid green and blue for wetter climatic vegetation types. Cultivated land is left in white. Details such as individual crops are shown by lettering and symbols. Each map also contains eight smaller maps (cartons) of which the following description is taken from the "Brochure éditée par le Centre national de la Recherche scientifique,"

La representation définitive pour l'établissement des Cartes comprend:

-- la carte de la végétation au 1:200.000, qui constitue le document principal;

-- 8 cartons au 1:1.250.000, destinés à compléter la documentation (cartons botanique, pédologique, utilisation du sol, agricole, pluviothermique, adversités agricoles), la signification des couleurs restant la même dans tous les cartons;

-- une légende;

-- une notice sommaire traitant, pour chaque série de végétation des conditions du milieu, de la végétation spontanée, de l'origine du milieu et de son utilisation par l'homme.

Les 8 cartons accompagnant la carte sont:

-- Un carton justificatif des travaux: référence des photographies aériennes et cartes utilisées; zones prospectées par les divers collaborateurs, etc...

Un carton géographique et administratif: limites départementales, principales villes, noms de pays, cours d'eau, hypsométrie.

Un carton botanique donnant l'indication des "climax", c'est-à-dire de l'évolution naturelle de la végétation sur tout le territoire de la feuille, y compris les zones cultivées. Cette notion de

"climax" mérite d'être précisée ici: La plupart des acceptions données à ce terme n'assignent pas de durée à l'évolution de la végétation vers son équilibre terminal avec le sol et le climat: le phénomène est généralement très lent et le stade climacique ultime ne sera atteint le plus souvent qu'au terme d'une très longue période. Le carton botanique indique seulement le sens de cette évolution pour une période de 100 à 150 ans -- soit quelques générations humaines ou une génération forestière. Il précise ainsi une première étape du dynamisme et la notion de climax ainsi définie prend, alors, dans l'immédiat, une valeur réelle au point de vue économique.

-- Un carton pédologique, où la représentation cartographique des sols est faite d'après des principes analogues à ceux de la représentation botanique: les couleurs affectées aux divers sols sont obtenues par mélange de couleurs simples r représentant les facteurs déterminants: nature de la roche-mère, lessivage, teneur en calcaire, humus, etc... La comparaison avec le carton botanique est le plus souvent très instructive.

-- Un carton d'utilisation du sol faisant apparaître: les zones forestières (avec la distinction des forêts soumises ou non soumises au régime forestier); les zones de pâtures et de terres incultes; les zones de prairies naturelles; les zones cultivées; les zones de production fruitière.

-- Un carton agricole où la statistique agricole cantonale figurant sur la carte au 1:200.000 sous forme de diagrammes, est reprise sous une forme colorée faisant état, pour chaque région, des trois principales cultures transcrites dans des limites "biologiques" et non pas seulement "administratives". Cette méthode fait ainsi apparaître les zones réelles de cultures avec leurs caractéristiques essentielles.

-- Un carton pluviométrique groupant les indications relatives à la pluviométrie annuelle, à la température moyenne annuelle et éventuellement à certains coefficients climatiques tels que l'indice d'aridité, lorsque ces données paraissent en rapport avec la distribution de certains types de végétation régionaux.

Un carton des adversités agricoles où sont figurès les roses des vents, les trajectoires d'orage, les chutes de grêle et, éventuellement, les incendies, les zones inondées, etc...

The second series has the most promising title of Carte Ecologigue de la Vegetation du Monde a 1:1,000,000 (Carte international du tapis vegetal). A proof of the sheet of the series (Tunisia) may be shown Rio congress.

At the University of Montpellier, is the "Service de la carte des groupements végétaux de la France au 20.000" under the direction of Professor M. Emberger. The following general statement is taken again from the brochure published by the Centre National de la Recherche Scientifique".

1. Généralités.

La C.G.V., botaniquement, est une carte des associations; pratiquement, pour l'usager non botaniste, elle est essentiellement une carte de la vocation des sols. Elle a, en plus de sa valeur agronomique, un grand nombre d'autres qualités.

Nous avons adopté l'échelle du 20.000, parce que les échelles plus petites, au delà du 25.000, font rapidement perdre aux cartes l'intétêt pratique immédiat que nous voulons qu'elles aient au stade des réalisations effectives.

Le praticien veut trouver sur les cartes les renseignements sur des points précis. La grande échelle est indispensable, car elle seule peut rendre compte de la diversité des terres et mettre en évidence les détails nécessaires à la mise en valeur.

Cette échelle est aussi plus conforme à la tendance actuelle du remembrement des terres dans le but d'augmenter la surface des parcelles, afin que leur explcitation soit plus rentable. De plus, l'Institut Géographique National établit actuellement la carte topographique de laFrance au 20.000, qui est pour nous un fond cartographique parfait.

Cette décision a naturellement été prise après avoir essayé les autres échelles, de manière a choisir la plus intéressante et la plus économique pour le but poursuivi. Toutes les échelles plus petites ont dû être abandonnées; les cartes établies avec elles sont trop générales et ont, pour cette

raison, moins de valeur pour le praticien.

Sur la carte au 200.000, 1cm2 corresponde à 400 ha: en cartographiant au 20.000, 1 cm2 de surface corresponde à 4 ha, 1 mm2 à 400 m2; on peut donc, si l'on veut, y representer des surfaces de 4 ares, et très nettement une parcelle de 1000 m2 ou 10 area.

Cependant, la C.G.V. n'est pas strictement liée à une échelle donnée. Nous ne perdons jamais de vue que le rôle principal de nos cartes est d'être utiles; le but à atteindre détermine donc, en dernier ressort, l'échelle à adopter. C'est ainsi que nous avons cartographié parfois au 15.000, au 10.000, au 5.000 et même, exceptionnellement, au 2.000, suivant la nature des problèmes posés.

Chaque échelle a ses possibilités; le 20.000, adopté pour l'ensemble de la C.G.V., s'est révélé être la plus pratique des échelles moyennes conciliant à la fois les nécessités techniques et celles de faire des cartes utiles."

The scale of the map permits an amazing amount of factual detail; in fact these maps represent the most complete picture of what nature and man has done with the earth surface. For instance with regard to land use the maps indicate with precision the distribution of cultivation (permanent as well as alternating), of meadows and grassland, of vineyards and horticulture, with symbols indicating the type of crops or fruit trees. The sheets published and in preparation are generally located along the shore of the Mediterranean from the delta of the Rhone to St. Tropez. With regard to all three series of maps France can be congratulated for the courage to start such a tremendous enterprise and for the very high standards achieved on the work already done.

Switzerland

Land use mapping has played a very significant role in Switzerland since the first World. It has been, however, largely motivated by practical aims, and consequently carried out mainly by organizations other than geography departments

of the various universities.

In 1926 Hans Bernhard, Professor at Zürich University for agricultural geography and director of Schweizerische Vereinigung für Innenkolonisation, published the guiding principles for a combined cadastral survey and land use mapping (Ein schweizerischer Kataster für Innenkolonisation, Zürich, 1926.) In the following years many areas were surveyed and in several cases the results were published (e.g.: Ergebnisse des Katasters für Innenkolonisation in Aargauer Jura, Zürich, 1930). This survey did not, however, cover the whole of Switzerland, and was never published totally.

During the second world war, F.T. Wahlen, Professor at the Federal Institute of Technology and during the war working at the Federal Bureau of Agriculture, conducted a nationwide survey called "Landwirtschaftlicher Produktionskataster". This survey differed in many points from the one mentioned above, but it included also a land use map in 1:25,000 or 1:50,000 for the whole country. The survey was not published. The principles are explained, and a sample of the land use map is published in the following publication: Wahlen F.T.:Das Schweizerische Anbauwerk 1940-1945, Vierteljahrschrift, Naturf.Ges.Zürich, 1946.

At the same time the Department of Geography, University of Zürich, prepared an economic map of Switzerland at a scale of 1:300,000, which includes the land utilization of the country. The explanatory text was written by H. Carol, Assistant Professor at the Geography Department, Zürich University: Begleittext zur wirtschaftsgeographischen Karte der Schweiz, Geographica Helvetica 1946. The map was published by Kümmerly & Frey, Bern. (Wirtschaftsgeographische Karte der Schweiz, Bern, 1946)

Land use maps were prepared by geographers and others very frequently in connection with practical needs within the past year. In most cases they were not published, or they are obtainable only with difficulty. They include, e.g., maps prepared for regional planning projects (Airport Kloten, Zürich), hydroelectric projects, etc.

Some of the geography departments at Swiss universities have mapped considerable areas within the last few years. Zürich University has been active in northeastern Switzerland, primarily in the states of Zürich, Schaffhausen, Glarus, and the Grisons. These projects have a research character, and include the application of intensive airphoto interpretation.

Austria

Dr. H. Bobek of the Geographical Institute of the University of Vienna reports that up to now no definite land use survey or any sort of a comprehensive plan for land use mapping in Austria has been established, nor does it seem likely that such an undertaking will get on its way soon.

On the other hand a number of regional land use studies are being prepared or already completed in the various departments of the three universities in the form of theses. Summaries are being published currently in the Geographischer Jahresbericht aus Österreich, the last volume being the XXV (1953-54).

Other such mapping is regularly undertaken in various places of Lower Austria by the department at the University of Vienna as training for the students. Up to now no results have been published, however.

A larger plan for the mapping of Carinthia is being considered by Dr. Bobeck in connection with the planning authorities of the Province with a view to comparing conditions in the early 19th century with the present ones.

The scheme of the World Land Use Commission has not yet been adopted.

The nearest approach to a land use survey is Map 12 of the Atlas of Lower Austria (Atlas von NiederÖstereich), edited by Dr. Erik Arnberger and published in 1952 by Freytag-Berndt Vienna and by the Committee for Aereal Study and Reconstruction of the Austrian Academy of Science.

Map 12, entitled "Types of Use of the Land in Lower Austria" is on a scale of 1:500,000. Indicated on the map by color are forests, cropland, pasture, and combinations of those. Also differentiation are cereal crops, root crops, vineyards, and horticulture.

Germany

Dr. C. Troll, Director of the Geographical Institute of the University of Bonn writes as follows:

"In Germany agricultural geography got an important stimulation by Leo Waibel's book 'Probleme der Landwirtschaftsgeographie' (1933), especially for a detailed land use survey in agricultural regions of West Germany.

In the same time A.Rühl in Berlin was rather active in a similar direction, giving a first example of his views in his book on Australia 'Das Standortsproblem in der Landwirtschafts geographie' (1929), but more on a statistical basis than Waibel.

From Waibel's school at Bonn between 1933 and 1940 a series of local studies appeared in the 'Beitrage zur Landeskunde der Rheinlande':

Müller-Wille, W., on the field systems of the Birkenfield region,

Smithüsen, J., on the "Niederwald" (forests regenerating by sprouting from the rootstocks),

Schüttler and Pfeifer, on the Limestone areas of the Eifel,

Paffen, K.H., on the change of land use in the Eifel.

The activity was continued for some years by W. Credner at Munich. A few very good monographs on the basis of land use survey were published at Munich (Mitteilungen der Geograph. Gesellschaft München), e.g. for the hop region of Hallertau north of Munich (Fuchs 1937) and for the Franconian Alb (Ulrich 1940).

W. Credner founded a working group of agrarian geography, continued after his death by G. Pfeifer and later by E. Otremba. During some years annual reports were published in the 'Zeitschr. f. Erdkunde' (Frankfort) until 1944, later some practical hints for land use survey by Schmithüsen and Otremba in the 'Geographisches Taschenbuch' (since 1949). Actually Otremba is still the chairman of the group, but in the last years the activity was less. Otremba wrote his concept of agrarian Geography in his book (Allgemeine Agrar- und Industriegeographie' (Stuttgart 1953).

Myself as successor on Rühl's chair at Berlin 1936 and later on Waibel's chair at Bonn (1939), continued with my students the agrarian survey of Rhineland, but also from other regions and foreign countries single dissertations were worked out.

I give you a list of published monographs, all containing maps. So far they are accompanied by detailed land use maps, they are -

Nr. 12. P. Schmidt, Nordkalabrien (Italy), 1937.

Vol. 42. F. Monheim, Die Bewasserungswiesen des Siegerlandes. 1943.

Nr. 3. J. Zimmermann, Bodenkultur und Landschaft der Erft-Niederung. 1949.

Nr. 5. L. Timmermann, Das Eupener Land und seine Grunlandwirtschaft, 1951.

Nr. 10. K. Hueck, Urlandschaft und Kulturlandschaft in der Provinz Tucuman (Argentinien), 1953.

Nr. 12. M. Schwalb, Ostfriesland und Westoldenburg. 1953. (cultivation of moorland)

Nr. 4. Sins, G., Die Baumschulen des Rheinlandes, 1953 (tree nurseries)

Nr. 8. E. Barners, Landnutzung und agrargeographische Struktur des Bitburger Landes, 1955.

Nr. 9. Kufferath-Sieberin, G., Die Zuckerwirtschaft der linksrheinischen Bordelandschaft. 1955.

By far not all our dissertations are published, but some are under press or in preparation for printing.

We have now a systematic material for the Rheinland, about 35 examples of typical agrarian regions of the Rhineland, with land use maps mostly in the scale 1: 25000. I hope to get the funds for publishing in the coming years an atlas and a text volume of this interesting material, including also a land use map of the country in 1:200 000."

A detailed study of one area -- Botburger Land -- was made by Ernest Barners and published by the Geographical Institute of the University of Bonn, under the direction of Carl Troll and Fritz Bartz, in 1955 (Ernest Barners) Landnutzung and agrargeographische Struktur des Birburger Landes.)

The map, scale 1:25,000 covers two topographic sheets, Bitburg and Kyllburg. The key for the land use is exhaustive and thru combination of color, lines, dots and symbols covers everything. For the forested areas, for instance, it indicates not only the type (broad leaved versus conifers) but also the prevailing types of trees. With the map is a text and also smaller maps for the individual crops. It is a perfect example of the German thoroughness of field study and can be highly recommended for those geographers planning similar work.

Belgium

Belgium has carried out an extremely detailed land use survey on the scale of 1:10,000. The survey related to the years 1952-55 and by January 1956 more than 90 per cent of the country has been covered. The maps are hand colored and five copies of each are made. It is planned later to

publish maps on the scale of 1:50,000. The work has been done with close collaboration between the soil experts, notably Professor Tavernier of Ghent, and the geographers, notably Professor O. Tulippe of Liege.

Great Britain

The Land Utilisation Survey of Britain and its work are well known and need not be described. The Survey began work in 1930 and carried out most of the field survey in the years 1931-33, completing the whole of England, Wales, Scotland, and the Isle of Man before the outbreak of war. The Channel Islands were covered later. The field survey was made on the scale of 6 inches to one mile, and the results reduced to the scale of one inch to one mile for publication. On this scale 150 fully colored sheets, covering the whole of England, Wales, the Isle of Man, and the more populous parts of Scotland were published, the last sheet being issued in 1949. Copies of the remaining unpublished maps are deposited in the Map Collection of the Royal Geographical Society. The work was fully described in a series of 92 County Reports which form nine quarto volumes (now out of print as a whole, but some parts, mainly of Scotland, are still available) entitled The Land of Britain. The whole was summarized in one volume by the Director, Dr. L. Dudley Stamp, entitled The Land of Britain: Its Use and Misuse (London: Longmans Green, 2nd Edition, 1950). In addition to the published one-inch maps, a generalized map of Britain on the scale of 1:625,000 (approximately 10 miles to one inch) was prepared and published in two sheets. Later developments included maps on the same scale of Land Classification, Types of Farming, and Natural Vegetation, Grassland (of England and Wales only).

Northern Ireland

The Land Utilization Survey of Northern Ireland was organized by Mr. D.A. Hill, and the one inch maps (11 sheets) published between 1947 and 1951. The land classification and coloring adopted for the maps follows that for England, Wales, and Scotland, except that a special category was added for the boglands or peat moors which are so characteristic of Ireland. Also in Ireland, where grass is so

enormously important, the grassland category, colored green, includes both the good permanent pasture and rotation grass. A very full report was published for the Belfast sheet, and it is planned to produce a general report on the whole of Northern Ireland for publication is possible by 1958. The maps and report are in print and are available from the Ordnance Survey Office, Armagh House, Belfast, or from Mr. D.A. Hill at Borough Road, College, Isleworth, Middlesex.

Denmark

A general map of land use of Denmark has been published by the Geogetic Institute of Denmark on a scale of 1:300,000 (2 sheets) with the cooperation of the Geography Laboratory of the University of Copenhagen.

Cropland and stockraising are indicated by their intensity (6 classes) from light yellow for low to dark brown for high. Crops and the number of swine and cows per square kilometer are also indicated. The map also presents the area in potatoes and horticulture, and indicates the chief type of forest as well as sandy areas and moors. The colors are striking and the map gives a good picture of Danish land use.

Professor Niels Nielsen reports that six volumes of the twenty planned for the Fifth Edition of the topographical handbook (Trap: Danmark) have been published and that a comprehensive account of land use is given of each parish described. He also reports that the polder investigation established by the Danish government includes very detailed studies of land use.

Sweden

Sweden has an excellent set of land use maps on a scale of 1:10,000. The maps show in yellow the croplands and grazing lands; in green, forests and marshes; and in white, built-up areas. Shadowing is used to indicate differences, such as between cropland and grass. The maps are so detailed that even individual boulders in the cropland or grassland are indicated. Up to December 1, 1955, four thousand sheets had been completed. The remaining sheets will be published at

an average of 400-500 sheets a year, the work to be completed in the year 1970. Because of the large number of other details these maps contain, some of which are of military significance, the maps are not available for the public.

The Americas

Canada*

In Canada, land use maps are of special significance because of the emphasis on agricultural activities. Most of the land use surveys have been conducted to meet special problems, and comprehensive land use surveys, including all uses of the land within a single national program, are yet to be developed. The special groups working in the field are the Geographical Branch, Department of Mines and Technical Surveys, Ottawa; the Ontario Department of Planning and Development, Toronto; and the Department of Geography of McGill University, Montreal.

1. The Geographical Branch, Department of Mines and Technical Surveys. Surveys have been made of the following areas:
    1. Halifax County, N.S.
    2. Annapolis Valley, N.S.
    3. Digby to Lunenburg, N.S.
    4. Minas Basin, N.S.
    5. Sydney area, N.S.
    6. Southern Alberta

The aims and objectives of these studies have varied somewhat and so have the final results. The prime objectives of all the studies was (1) to map agricultural land use; (2) to provide a method of land use surveys that can be used and applied in at least the main regions of Canada; and (3) to enable all the uses of land to be related to the

* Most of the material used here is from a report made by Dr. Preston E. James to the Investigating Committee on Land Classification and Use Surveys of the Commission of Geography of the Pan American Institute of Geography and History at the General Meeting, Mexico City, July-August 1955.

environment and to each other. Surveys recorded rock types, glacial lake or marine transgression, evidences of erosion, and land use characteristics associated with the texture of soil and types of vegetation cover. The emphasis of the work has been upon economic geography, principally on resource utilization, occupation, and settlement.

In all the surveys, air photographs were used in the preliminary states of mapping and a variety of scales have been used for the final maps ranging from 1:25,000 to 1:31,680.

The method of plotting the land use and the information obtained varies somewhat with the different surveys. The Fundy-Annapolis and Digby-Lunenburg Surveys were conducted by means of selected sample areas. In addition to the samples, reconnaissances of the whole area completed the land use survey. Detailed land use maps are thus available only for the sample areas. Mapping was done on the air photographs (1:1,320) and transferred with the sketchmaster to the 1:31,680 base maps. The legend (see below) is a modification of that used by the World Land Use Survey.

1. Settlements and non-agricultural land	plain	crimson lake or scarlet lake
2. Tree crops	O	purple
3. Specialty crops e.g. strawberries	plain	violet
4. Market gardens	MG	vermilion
5. Root crops	plain	burnt ochre
6. Grain	G	sienna brown with yellow-orange outline, or yellow-orange or yellow ochre
7. Hay	H	dark brown
8. Corn		burnt ochre, right diagonal haching
9. Permanent pasture	P	apple green
10. Rough pasture	PP	apple green, right diagonal haching or peacock green, or orange
11. Unused land	UN	dark grey
12. Poultry houses	black squares	or letters P.F.

13. Cut-over coniferous forests	COC	dark green dots
14. Cut-over deciduous forest	COD	may green or apple green dots
15. Cut-over mixed forest	COM	dark green or may green dots or dark green and apple green dots
16. Bush	B	solid may green or dark green hachures
17. Swamps (bogs)	SP	aquamarine
18. Salt marshes	SM	aquamarine right diagonal hachures or flesh pink
19. Bottomland	BL	ultramarine
20. Rivers and Lakes		indigo blue or light blue
21. Burned over (Minas Basin Survey only)		emerald green vertical hachures

A similar method was followed by the Minas Basin Survey in that air photographs were used for field mapping. The photographs were on a scale of 1:2,640 and the information was transferred with the sketchmaster to 1:63,360 base maps. The information mapped was the same as that of the Fundy-Annapolis and Digby-Lunenburg Surveys. However, in this survey it was found possible completely to cover the agricultural areas in the field. Forest land use was interpreted from the air photos.

The Halifax County land use survey was prepared entirely from air photo interpretations with the aid of keys prepared in the field. The photos were on the scale of 1:1,320 and were transferred by Sketchmaster and Seelyscope to 1:63,360 base maps. A modified version of the world land use scheme was used as follows:

Cultivated	brown
Pasture (1) Improved	apple green
(2) Rough	vermillion
Idle land	yellow
Orchards	light purple
Gardens	deep purple
Barren	dark grey
Bog	prussian blue - grey-blue

Woodland

(1) Coniferous - olive green
(a) high -- plain color (b) small growth -- superimposed inverted V (c) cut-over -- superimposed dots

(2) Mixed - dark green
(a) high -- plain color (b) small growth -- superimposed inverted V (c) cut-over -- dots

(3) Deciduous - may green
(a) high -- plain color (b) small growth -- inverted V superimposed (c) cut-over -- dots

Urban

1. Residential	-- plain scarlet
2. Commercial, Financial, Administration	-- horizontal hachures -- scarlet
3. Industrial	-- cross hachures -- carmine
4. Shipping	-- right diagonal -- scarlet
5. H.M. Forces	-- left diagonal hachures scarlet
6. Gold courses, Parks, University Grounds, Cemetary	-- vertical hachures -- carmine
7. Quarries, Gravel pits, sand pits	-- plain carmine
Water	-- medium blue

The scale of base maps and the nature of the agriculture necessitated the rather different approach taken by the Cape Breton Survey. A land use map, as such, was not prepared, but rather dot maps on a scale of 1:126,720 and then such items as cleared farm land, abandoned farms, poultry farms, distribution of cattle, farms combining forestry and agriculture, etc. This survey, therefore, was more concerned with the type of farming rather than a qualititative analysis of the agricultural land use.

Thus is the four surveys discussed above, three different methods of mapping have been attempted. In the Halifax County Survey air photo keys were used as a basis for the complete air photo interpretation of a large area. In the Fundy-Annapolis and the Digby-Lunnenburg studies sample areas were selected which would typify the region as

whole. In the Minas Basin study complete cover mapping was carried out.

In Southern Alberta, land use studies were carried out during three successive summer seasons (1952-54) of eight pre-selected areas. The areas covered by the detailed survey were -- Canmore, Jumping Pound, Lochend-Airdrie, Conrich-Langdon, Bassano, Brooks, Taber, and Manyberries.

In general the sample areas were selected on the basis that they represented most of the physical and cultural complexes to be found in the southern part of the province.

Land use within these sample areas was plotted on air photographs and later transferred to the 1:63,360 scale and further reduced to 1:190,080 scale (at which scale a generalization was necessary).

Grain Crops
Grain - G
Wheat - GU
Oats - GO
Rye - GR
Barley - GB
Flax - GF

Speciality Crops
Speciality - R
Vegetables - RV
Sugar Beets - RNS
Corn - RC
Potatoes - RP
Garden - RG

Pasture
Pasture - P
Improved - PI
Rough or natural pasture - PR
Pasture with scrub growth - PSC
Sage - PSA

Hay Crops
Hay - H
Wild hay - HW
Clover hay - HC
Alfalfa - HA
Timothy - HT
Wheat grass - HWT

Fallow
Fallow - FA
Open or plowed fallow - FO
Stubble - FS
Improved - FI

Forest
Commercial - FC
Woodland - FWD
Scrub - FSC

Water
Water - W
Permanent - WP
Temporary - WT
Farm Pond - WPO

Non-Agricultural
Non-agricultural - NA
Settlement - NSE
Idle - NI
Waste - NW

Reservoir - WR	Weeds - NWE
Swamps - WSW	Eroded - NE

The 1:190,080 scale permits the recording of present land use (predominant land use per one-quarter section) quickly and accurately over wide areas. Experience with plotting on this scale would indicate its use as a mimimum scale. The transportation of the land-use data to the 1:1,000,000 has been tried as an experiment in a limited area, and the presentation of land use data proved satisfactory.

2. Ontario Department of Planning and Development. The surveys conducted are a continuation of surveys of watersheds started in 1945. Since 1952 the following reports have been published: Saugren Valley, 1952; Upper Thames Valley, 1952 (resurvey of 1946 study); Big Creek Valley, 1953; Upper Holland Valley, 1953; and Middle Martland Valley, 1954. The land use mapping is carried out in the field and is recorded on aerial photographs on a scale of approximately 1 inch to 1,000 feet with topographical maps on 1 inch to 1 mile scale as auxiliary aid. The mapping is of a reconnaissance type. For each category of land use an estimate is made within a block enclosed by concession roads and side roads of approximately 1,000 acres. The published maps are either in black and white or multi-colored and show four to nine land use categories. Their scale varies from 1:42,000 to 1:200,000. In the Saugren Valley report, for instance, the following categories were shown: cultivated, cultivated and pastured, pastured, cultivated and forested, pastured and forested, mixed use, and forested. The percentage of one category in the block in relation to others forms the basis of classification. When 60 per cent or more in one block area is occupied by one use, that class is mapped as dominant. If no class is dominant and two uses account for 60 per cent or more, then two classes are combined. If no one or two uses account for 60 per cent or more, then the use is classified as mixed land use.

Recommended land use maps accompany the present land use maps. The recommended land use is based on present use and on capability of those practices which have been found suitable for different soils. Consequently the boundaries of the classes for recommended land use follow the boundaries of soil types and conditions. Land use classes are designated by color, and each category is described in brief

marginal notes. For instance, in the Saugren Valley Report six classes of recommended use are shown: 1. cultivated land (light yellow), 2. restricted use (dark yellow), 3. conservation farming (brown), 4. drainable land (blue), 5. pasture (light green), woodland (dark green).

3. The Geography Department of McGill University has been investigating the surface characteristics of the Labrador-Ungava area using recent air photographs.

The purpose of this study is two-fold.

1. to construct reconnaissance maps on the scale of 1:100,000 of cover-type (principally vegetation).
2. to construct maps of surface types on the same scale.

The resulting maps will be generalized and reduced to the scale of 1:1,000,000.

The Cover Type Series, which is similar to a land use map in an area devoid of human habitat except for mining and hunting, shows the following classes:

1. Vegetation
   - closed-crown forest - green
   - Lichen woodland - yellow
   - Bog and muskeg - brown
   - Bare rock, dry scrub, etc. - red
2. Others
   - Open water - no color
   - Burned areas - purple

Besides the maps published by the three already mentioned agencies reference should be made to two articles which appeared in the Geographical Bulletins, namely, "Land Classification as Part of a Geographical Survey of the Avalon Peninsula of Newfoundland" by Lloyd G. Reeds (1954) and "Rural Settlement and Land Use in the New Glasgow Area (1955)". The new land use map of the Avalon Peninsula used the system of the World Land Use Survey (map scale 1:1,000,000).

Besides the maps published by the three agencies mentioned above, reference should be made to two articles which appeared in the Geographical Bulletin, namely "Land Classification as Part of a Geographical Survey of the Avalon Peninsula of Newfoundland" by Lloyd G. Reeds (1954) and "Rural Settlement and Land Use of the New Glasgow Area" (1955). The land use map of the Avalon Peninsula used the system of the World Land Use Survey (scale 1:1,000,000).

In New Brunswick, Miss M.H. Cunningham, while holding a Beaverbrook Graduate Studentship from the University of New Brunswick, worked under Dr. Stamp on the interpretation of air photographs of northeastern New Brunswick. Her work showed how intimately land use and the existence of farm clearing is related to the access of roads and stressed the need for a continuation of the studies.

United States of America

There is a long history of the development of land classification and use surveys by professional geographers in the United States. The first of such surveys were directed by John Wesley Powell during the latter part of the 19th century and were applied to the western states. The purpose was to identify those lands suitable for irrigation, those suitable for dry farming agriculture, and those suitable for grazing or for the growing of forests. In the present century there have been a series of notable surveys done in detail on large scale maps. During the 1920's the Michigan Land Economic Survey attempted to portray the conditions of the land and land cover as a guide to State tax and zoning policy. In the 1930's the geographers of the Tennessee Valley Authority produced maps of land quality and land use as basis for the land planning activities of the Authority. More recently the Puerto Rico Rural Land Classification Program has provided a very large scale picture of land character and present use as a basis for the planning of economic development, this will be discussed later.

At present relatively little work is done by the Federal Government with regard to land use mapping. Dr. Carleton P. Barnes, Research Co-ordinator of the Agricultural Research Service of the United States Department of Agriculture, reports as follows:

"Up until July 1, 1955, the Soil Conservation Service mapped present land use in connection with each of its soil and conservation surveys. As of that date, a total of 473,000,000 acres had been mapped. This, however, differentiated only among the major land uses, namely, crop land, pasture, and woodland. Since July 1, 1955, the land use mapping is only done on selected areas where there is felt to be a particular need for it.

"By mapping land use in connection with the soil survey, it is possible estimate the extent and location of soils potentially productive for crops which are not so used. Estimates of the amount of such land for the country as a whole and for regional groupings of states have been made periodically, based upon the mapping that has been completed, used more or less as a sample.

"I do not believe any other department of the Federal Government or any of the States is carrying on a systematic program of land use mapping. The University of California, in cooperation with U.S. Forest Service, is making what is called a soil-vegetation survey, which aims to cover 25,000,000 acres of predominantly forest and associated range lands in the mountainous parts of the State. It would therefore hardly qualify as a land use mapping activity of the sort you are concerned with."

The present stress of the United States Department of Agriculture is on land capability maps. It may be worthwhile to discuss them briefly. Eight different classes are recognized and mapped by separate color. Four of them are regarded as suitable for cultivation and vary from excellent to land with very severe limitation. The other four, not suited for cultivation vary from good for grazing or forestry to not suited for cultivation, grazing, or forestry. Such maps are made for individual farms and a detailed evaluation of the capability classes on that farm is included. Formerly a land use map was also included but that seems to have been omitted in later years.

Outside of the United States Government a large number of studies are made by universities which specialize in agriculture or offer graduate training in geography, but most of these studies are of only local significance. For instance, the Graduate School of Geography of Clark University, which showed land use maps of Massachusetts at the Washington conference, has continued its work across the state borders into New Hampshire and Connecticut. It seems almost unnecessary to mention that the classification of the World Land Use Survey Commission is used. Of special note is a study of the effects of the St. Lawrence Seaway on the area of the United States and Canada tributary to that route. Several universities of Canada and the United States are collaborating on this inter-disciplinary project the direction of which is in the Maxwell Research Center of Syracuse University. Included in the program of studies are

land classification and use surveys to be carried out by geographers.

Puerto Rico

The land use mapping of Puerto Rico was part of the Rural Land Classification Program of Puerto Rico and was done under the supervision of Dr. Clarence F. Jones and with the cooperation of Dr. Rafael Pico, Chairman of the Puerto Rico Planning Board. After pilot studies had been made, the island was divided in 18 mapping units, varying in size between 125 and 289 square miles. The mapping was done by field teams in the years 1949-1951 covering 3,429 square miles. The land use mapping was done on a scale of 1:10,000 on an airphoto basis of the same scale; topographic maps also were used. The Key distinguished between Cropped Land, Pasture and Harvested Forage, Forest and Brush, Non Productive Land, Rural and Community Service, Quarrying and Mining, and Urban and Manufacturing Land. Cropland was subdivided in 20 different types also taken combination of those and other types of land use under consideration. The heading Pasture and Harvested Forage had 8 subdivisions; Forest and Brush, 7; and Non-Productive land, 5. However, the Puerto Rico study went much beyond straight land use mapping. It differentiated between the quality of the land use (good -- average -- poor), it introduced soil mapping (53 field mapping units), Classes of Slope, Drainage, Erosion and Stonyness and Rock Exposure ingeniously expressed in 5 digits, one for each of the five mentioned units. For instance $\frac{112}{52\text{-}1121}$ means cropland[1], sugarcane[1], good quality[2], organic soils of the seacoast[52], slope 0 - 2 degree[1] adequately drained land[1], no observable erosion[2], and no stoniness nor rock covering[1]. The result is that probably more is known about Puerto Rico than of any other area of comparable size and that the study is of tremendous value to planning for the future.

Venezuela

Venezuela is far ahead of most South American Republics in land use mapping. Both oil money and the interest in agricultural development of such great international figures

as Rockefeller have played a key part in this. Most of the work has been done by the special efforts of the American International Association, the so-called Consejo de Bienestar Rural, through its Division of Special Studies. No expense has been spared in carrying out these studies and the resulting publications are both precise and beautiful in format. To date separate publications have come out entitled: Problemas Economicos y Sociales de los Andes Venezolanos and Recursos Agricolas del Estado Yaracuy. Each has detailed maps of land use, soils, climate, and natural vegetation. Studies are under way in the States of Monogas, Barinas, and Falcon. Information can be obtained from Dr. Louis Heaton, Chief of Special Studies Division, Consejo de Bienestar Rural, Apartado 2797, Caracas.[1]

Costa Rica

For Costa Rica at least one land-use map is available. In addition there is a good map of agricultural regions and a number of areally restricuted but detailed studies of land use. Most of the work has been done with the collaboration of the Inter-American Institute of Agricultural Sciences, Turrialba Costa Rica.

The following publications have appeared:

Morrison, Paul C. and Leon, Jorge. "Sequent occupance, Turrialba Central District", Costa Rica.

Painter, Norman W., and Morrison, Paul C. "Rural Population Stability, Central District of Turrialba Canton, Costa Rica." Rural Sociology, Vol. 17, no. 4, Dec. 1952, p. 356-366.

Peterson, Arthur V. & Lewis, A.B. "Studying land use in Costa Rica; applicability of the method to other regions". Turrialba, 1953. Instituto Interamericano de Ciencas Agriculas, Comunicaciones de Turrialba, no. 30, Jan.1953.

Leon, Jorge. "Land Utilization in Costa Rica". Geographical Review, vol. 38, no. 3, July, 1948, pp. 444-456.

Becker, H.F., 'Land Utilization in Guancaste Province of Costa Rica". Geographical Review, vol. 33, 1943, pp. 74-85.

[1] The author is most indebted to Mr. Joseph A. Tosi, forester and ecologist of the Instituto Interamericano de Ciencias Agricolas, for information on Latin America.

Morrison, Paul C. Land Utilization Cartago to Turrialba Costa Rica, Michigan Academy of Science, Arts and Letters. Vol. XL, 1955.

Brazil

In relation to the types of geographical studies that have been carried out in Brazil it is necessary to point out a basic difference between the agencies that produce these studies:

a) The Conselho Nacional de Geografia is the basic organization with the special task of coordinating and carrying out certain kinds of geographical activities. Every state in Brazil has a branch agency of the Conselho that in some degree carries on geographical work.

b) The Universities, specifically the Faculdades de Filosofia, with a Department of Geography also produce an appreciable amount of work. In this respect the University of Sao Paulo and the University of Brazil in the Federal District are the two outstanding ones, followed by Minas Gerais, Rio Grande do Sul, Pernambuco, and Bahia.

c) Some specialized governamental agencies produce geographical work in their fields of special interest, such as the Servico Geologo, the Instituto de Colonizacao, etc.

Since most of these activities are in the Conselho Nacional de Geografia, this report is concerned chiefly with the activities of the Conselho and makes reference to other institutions as necessary. The PAIGH itself through the Training Center for Resource Evaluation in Rio de Janeiro is also producing a considerable amount of geographical research directly concerned with the classification and evaluation of natural resources.

The primary concern of the Conselho Nacional de Geografia in these recent years has been to produce a Geography of Brazil by regions and by specific topics such as Physical, Human, and Economic.

In the series of regional studies actual field work has been carried out in the different regions of Brazil; since 1952 field investigation has been done in the following areas:

a) The North of Brazil; field trips to the Acre and Rio Branco Territories with the objective of producing a

reconnaissance study of these two territories for purpose of providing the Administration with basic information concerning not only the problems of land use and types, but also with more generalized information regarding all aspects of the economic development of the area.

b) The Northeast of Brazil: Field work was done on a small scale; the effort was directed to completion of previous work specially in the State of Ceara in order to provide information for the evaluation of the needs and possible use of an irrigation system for the Jaguaribe Valley.

c) The East of Brazil: Several projects have been under study in this region. The survey of the Rio Doce Valley was completed; it had as its main objective to provide the Companhia do Valle do Rio Doce with information on the economic development of the valley, its future possibilities regarding a better use of the land. A very complete study of soils was produced by using the catena system, which will provide valuable information for a more detailed study of land classification.

d) The South of Brazil: This is the region in which most of the land classification and use surveys have been made; since 1952 studies have been done in the Jacui Valley of Rio Grande do Sul with special reference to the rice area, and other projects started before 1952 have been completed, such as the Parana State atlas of colonization in which land use maps as well as vegetation, settlement, etc., were prepared. Some of these are either published or will be published soon. Another project has been under study in the South, this one carried out through cooperation of the Commission of Geography and the Department of Geography of Syracuse University. This project is concerned with a study of a part of Rio Grande do Sul (area of Caxias) and would provide information on land classification and use on a scale of 1:500,000.

e) The West Central Region of Brazil: This is probably the only area of Brazil in which a complete study of land use has been done in order to produce large scale maps of land use by using air photos. This study is being conducted by a private survey organization in Ithaca, New York, and its results are not yet available for publication. Besides that, a complete reconnaissance study of the region was completed and a detailed study of some areas were also

produced. Some maps of vegetation, landforms, climate, distribution of population, etc., were also produced. Some of these maps (Vegetation and Landforms) are on scales of 1:500,000 and 1:1,000,000.

Pilot Studies

The committee was instructed at the previous Consultations on Geography to undertake a series of pilot studies to experiment with the methods of work and to demonstrate results. Several such pilot studies have been undertaken.

One such study was carried out in the field in Northeast Brazil during 1950, and the results have recently been published. The chairman of this committee was the technical consultant on this study which was directed by the Conselho Nacional de Geografia. The report is in two parts. Part I "Observations on the Physical Geography of Northeast Brazil", Annals of the Association of American Geographers, Vol. 42, 1952: pp. 153-176. Part II "Patterns of Land Use in Northeast Brazil", Annals of the Association of American Geographers, Vol. 43, 1953: pp. 98-126. In this work an attempt was made to experiment with the methods of field mapping on a scale of 1:1,000,000. The resulting maps are chorographic in their degree of generalization, that is, they show associations of features rather than the specific forms of land use. The maps suggest the value of chorographic scale work as a basis for the selection of areas for detailed (topographic) studies done on large scale maps.

For the other Latin American Republics there are only spotwise studies. The following is a list of some of these.

Guatemala

Higbee, E.C. "The Agricultural Regions of Guatemala". The Geographical Review, 1947, Vol. 38.

Colombia

Guhl, Ernesto. "El macizo colombiano, Una region natural de Colombia". Boletin de Argueologia, vol. 1, no. 4, July-August 1945.

Guhl, Ernesto. "Geografia ye demografia en Colombia". Boletin de la Sociedad Geografica de Colombia, Vol. 8, 1952.

Parsons, James J. "The Settlement of the Sinu Valley of Colombia." The Geographical Review, 1952, vol. 42.

Crist, Raymond E. "The Cauca Valley, Columbia Land tenure land use." Baltimore, Waverly, 1952.

Bolivia

Keller, Frank L. "Geography of the Lake Titicaca Basin of Bolivia: A comparative study of great landed estates and Highland Indian communities." 1949.

Chile

In 1953-54, Mr. Gene Martin of Syracuse University undertook a pilot study in the Central Valley of Chile, working in cooperation with the University of Chile. His work was topographic in scale, and dealt with a small area as a sample study in which he analyzed the effects of the process of land redistribution on Chile's agrarian problem. A report on this study was made at the Section on Regional Geography of the Fourth Consultation in July 1955.

Ervin, Roger E. "Land Tenure and Land Use in South Central Chile." Ph.D. Dissertation 1954, University of Florida.

Another pilot study stimulated by the work of this committee is an investigation of the Caxias area in Rio Grande do Sul, Brazil, now being carried out by Mr. Stuart C. Rothwell with funds made available by Syracuse University and the Commission on Geography, described in the report on Brazilian activities above.

Peru

Lewis, Salera, Wills and Preston. "The Agricultural and Economic Development of the Mantaro Region of Peru." (2 volumes) International Development Services, Inc. 1270 Avenue of the Americas, New York 20, N.Y.

Eduador

Solis, Dr. M. Acosta. "Por la Conservacion de las Tierras Andinas." Quito June 1952 (Instituto Equatoriana de Ciencas Naturales, Quito).

Argentina

Hueck, Kurt. "Urlandschaft, Raublandschaft und Kulturlandschaft in der Provinz Tucuman im nordwestlichen Argentinien." Im Selbstverlag des Geographischen Instituts der Universitat Bonn. 1953. Heft 10.

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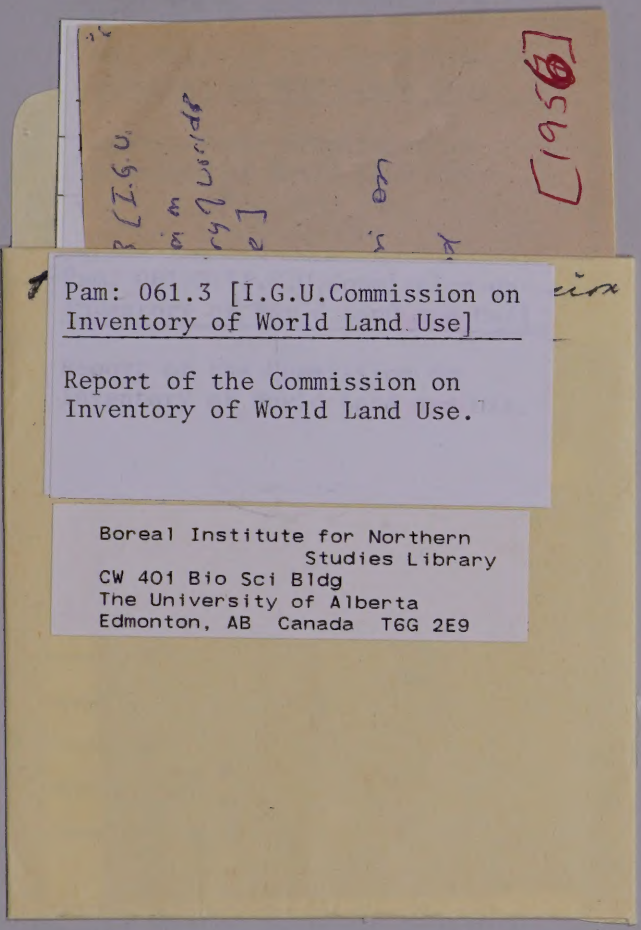

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